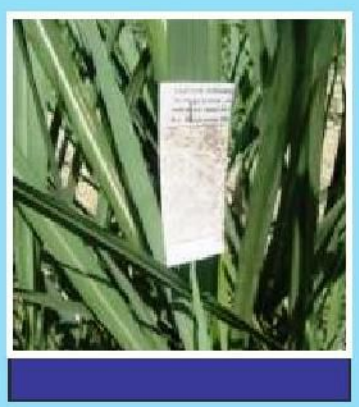
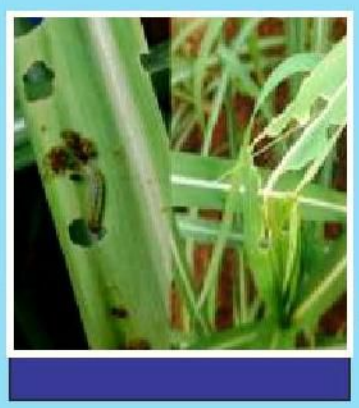
150 YEARS OF CELEBRATING THE MAHATMA

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

TECHNICAL REPORT
2018-2019

ENTOMOLOGY


Compiled by

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ISO 9001:2015

Technical Programme

Project E. 4.1

Title of Project	**:**	**Evaluation of zonal varieties/ genotypes for the reaction against major insect pests.**
Objective	:	To grade the entries in the zonal varietal trials for their behavior towards damage by key pests in the area.
Year of Start	:	1985-86 (Continuing)
Duration	:	Long -term
Location		As hereunder
North Western Zone	:	Karnal (SBI), Shahjahanpur and Lucknow.
North Central Zone and Eastern Zone.	:	Seorahi
Peninsular Zone	:	Akola, Padegaon, Pune, Mandya, Coimbatore
East Coast Zone	:	Anakapalle
No. of replication	:	03 (Three)
Plot size	:	A minimum of 3 (three), six metre row /variety per replication.

Project E. 28

Title of Project		**Survey and surveillance of sugarcane insect pests.**
Objective	:	To identify key insect of sugarcane in the area
Year of start	:	2003-04.
Duration	:	Long term
Location	:	All centres where entomologist are available

Project E. 30

Title of Project	**:**	**Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem.**
Objective	:	To monitor the key insect pests and natural enemies in the area.
Year of start	:	2006-07.
Duration	:	Long term
Location	:	Karnal, (SBI),Shahajhanpur Lucknow, Seorahi, Akola, Padegaon, Pune, Mandya, Kolhapur, Coimbatore, and Anakapalle
Plot size	:	Planting of sugarcane variety recommended for the region in 0.2 ha area.

Project E. 34

Title of Project	**:**	**Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agent.**
Objective	:	To develop simple and cost effective mass multiplication techniques of promising bio-agents of the area.
Year of start	:	2012-2013.
Modified year	:	2018-2019 [In 31st Biennial Workshop of AICRP on Sugarcane held at VSI, Pune (MS) on November 16-17,2016.
Duration	:	Three years

Location	:	Location and bio-agents to be multiplied.
Ankapalle	:	***Beauveria Bassiana***
Lucknow	:	***Metarhizium anisopliae, Bearuveria bassiana, Chysoperla carnae and E. melanoleuca.***
Padegown	:	***Chrysoperla zastrowl sillemi***
Coimbatore	:	***Cotesia flazvipes***
Pune	:	***Trichogramma sp.***

Project E .38

Title of Project	**:**	**Formulation and validation of IPM Module of sugarcane insect pests.**
Objective	:	To evaluate IPM Module in current.
Year of start	:	2017-2018
Duration	:	
Location	:	Under here
North central zone and Eastern zone		Seorahi
Peninsular Zone	:	Padegaon, Pune, Mandya
East Coast Zone	:	Anakapalle,
No. of replication	:	-
Plot size	:	A minimum of 3 (three) ,six metre row/ variety per replication

ANNUAL REPORT OF AICRP (S)

Project No. E. 4.1. Evaluation of Zonal varieties/genotypes for their reaction against major insect pests of sugarcane.

North West Zone

ICAR-SBI-RC, Karnal

AVT- I Plant: Eleven genotypes and two standard checks were evaluated against borer pests of sugarcane (Table-1). Incidence of early shoot borer, top borer, root borer and stalk borer ranged from 0.5–4.01, 5–9.9, 6.9–37.1 and 9.9–35.0 per cent, respectively. Stalk borer infestation index ranged from 1.1–4.2. All genotypes; showed least susceptible (LS) reaction to early shoot borer and top borer. Eight genotypes viz., Co 14035, Co 14261, CoS 14233, CoLk 14203, CoLk 14201, CoPb 14181, CoPb 14184, CoPb 14211 exhibited least susceptible reaction to root borer (<15%); two genotype viz., CoLk 14204 and Co 14034 were moderately susceptible (MS) (15.1 to 30 %) one genotype; CoPb 14185 was highly susceptible (HS) to root borer (>30%).

Table-1: Reaction of sugarcane genotypes against borer pests of sugarcane (AVT- I Plant)

Sl. No.	**Variety/ Genotypes**	**% Incidence**			**Stalk borer**		
		ESB	**Top borer**	**Root borer**	**Incidence (%)**	**Intensity (%)**	**Infestation Index**
Mid Late Maturing							
	Co 14035	2.5	9.6	13.1	13.9	8.8	1.2
1.	Co 14261	1.5	6.9	13.3	34.3	10.9	3.8
2.	CoS 14233	1.3	1.5	11.2	27.7	13.4	3.2
3.	CoLk 14203	1.0	7.0	6.9	14.4	6.8	1.4
4.	CoLk 14204	1.0	9.9	16.7	9.9	9.6	1.1
5.	CoPb 14185	1.8	3.6	37.1	20.5	12.4	2.7
6.	CoPb 14184	1.5	2.4	12.7	35.0	11.4	4.2
7.	Co 05011	0.7	1.5	9.0	44.5	13.8	5.6

Early Maturing							
8.	CoLk14201	0.5	4.2	13.4	11.9	20.8	1.8
9.	CoPb14181	1.6	3.1	10.3	24.9	12.9	3.0
10.	Co 14034	3.1	4.8	20.8	30.6	11.0	3.5
11.	CoPb14211	4.0	3.6	12.4	32.7	7.0	3.8
12.	Co 0238	2.8	5.8	41.8	15.2	5.5	1.7

In the case of stalk borer four genotypes; viz., Co 14035, CoLk 14203, CoLk 14201 and CoLk 14204 were least susceptible (LS) (infestation index < 2.0) and seven genotypes viz., Co14261, CoS14233, CoPb14181, Co14034, CoPb14185, CoPb14184 and CoPb14211were moderately susceptible (MS) (infestation index 2.1 to 5.0).

AVT- II Plant: Eight genotypes along with two checks were evaluated against borer pests of sugarcane (Table-2). Early shoot borer, top borer, root borer and stalk borer incidence ranged from 0.7–3.8, 0.6–2.6, 11.5–38.7 and 4.8–7.2 per cent, respectively. Infestation index of stalk borer varied from 0.3 – 6.6. All genotypes were least susceptible to early shoot borer (<15.0%) and top borer (<10.0%). In the case of root borer, two genotypes viz, CoPb13181, CoLk13204 were least susceptible (<15%); four genotypes viz., Co 13034, CoS 13231, Co 13035 and CoPb 13182 were moderately susceptible (MS) (15.1 to 30 %) and 2.0 genotype; CoH 13263 and CoPant13224 were highly susceptible (HS) (>30%).

Table-2: Reaction of sugarcane genotypes against borer pests of sugarcane (AVT, II Plant)

Sl. No.	Variety/ Genotypes	% Incidence			Stalk borer		
		ESB	Top borer	Root borer	Incidence (%)	Intensity (%)	Infestation Index
1.	Co 0238 Std.	6.6	5.1	17.0	38.5	16.1	5.4
2.	Co 13034	3.8	2.6	16.9	24.1	13.7	6.6
3.	CoPb 13181	1.9	2.2	11.5en	24.7	9.2	2.4
4.	CoS13231	0.7	0.6	19.3	21.9	7.2	1.5
5.	Co 13035	2.5	2.1	17.2	4.8	1.9	0.3
6.	CoH 13263	1.8	2.0	32.0	25.0	4.8	2.0
7.	CoPant 13224	3.6	1.1	38.7	27.2	12.0	3.2
8.	CoPb13182	1.6	0.8	21.3	23.7	5.0	2.1
9.	CoLk 13204	1.2	0.8	13.1	26.9	7.3	1.9
10.	Co 05011	1.5	0.3	13.4	18.1	12.2	1.5

In case of stalk borer, four genotypes viz, CoS 13231, Co 13035, CoH 13263 and CoLk 13204 were least susceptible (infestation index < 2.0) and three genotypes viz, CoPb13181, CoPant 13224 and CoPb 13182 showed moderately susceptible (MS) reaction (infestation index 2.1 to 5.0) and one genotype; Co13034 was highly susceptible (HS) (infestation index >5.0).

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AVT (Mid late) I Plant

Under AVT (midlate) First plant, total 7 genotypes viz., Co 14035,CoLk 14203, CoLk 14204, CoPb 14184, CoPb 14185, CoS 14233, and CoS 14261 alongwith three standard (checks) viz, CoS 767, Co 05011 , CoPant 97222 were evaluated against major insect pests of sugarcane.

Based on cumulative incidence of early shoot borer, only standard check CoS 767 showed moderate susceptible (MS) and rest of the genotypes alongwith two standard checks were less susceptible (LS) to early shoot borer.

At harvest, CoS 14261 showed moderate susceptible (MS) and rest of the genotypes along with and three standard checks were less susceptible (LS) to top borer.Regarding the stalk borer all genotypes were moderate susceptible (LS) to stalk borer. (Table 1 & 2)

AVT (Mid late) II Plant

Six genotypes viz., Co 13035, CoPb 13182, CoLk 13204, CoPant 13224, CoH 13263, and CoS 8436 and three standard (checks) CoS 767, Co 05011 and CoPant 97222 were evaluated against major insect pests of sugarcane.

Based on cumulative incidence 5.88% (CoLk 13204) to 11.05% (Co 13035), all the genotypes including standard check were less susceptible (LS) to early shoot borer.

At harvest, all the genotypes including standard checks were less susceptible (LS) to top borer. Incidence ranged from 4.00% (CoLk 13204, CoH 13263 and CoS 8436) to 8.00% (Co 05011 and CoPant 97222). In the case of stalk borer, Co 13035 and CoH 13263 showed less susceptible (LS), CoPb 13182, CoPant 13224, CoS 8436 including three standard checks Co 05011, CoS 767 and CoPant 97222 were moderate susceptible (MS) and only one genotype and only one genotype, CoLk 13204 was highly susceptible (HS) (Table 3 & 4).

AVT (Early) I Plant

Four genotypes viz., Co 14034, CoPb 14181, CoLk 14201, CoPb 14211 along three standard (checks) viz., Co 05009, CoJ 64 and Co 0238 were evaluated against major insect pests of sugarcane.

Based on cumulative incidence of shoot borer all the genotypes including standard checks showed less susceptible (LS) reaction. At harvest all the genotypes and one stadandard check, CoPant 97222 were less suscetible (LS) while two standard checks viz., Co 05009 and CoJ 64 showed moderate susceptible (MS) to top borer. CoPb 14211 and standard checks Co 05009 were less susceptible(LS) and rests of the varieties moderate susceptible (MS) to stalk borer (Table 6 & 7).

AVT (Early) II Plant LANT

Three genotypes viz., Co 13034, CoPb 13181, and CoS 13231 and three standard (checks) viz., Co 05009, CoJ 64 and Co 0238 were evaluated against major insect pests of sugarcane.

Based on cumulative incidence of early shoot borer only the Co 13034 genotype alongwith standard checks Co 0238 were moderate susceptible (MS) while rest of the tested genotypes alongwith standard checks showed less susceptible (LS) to early shoot borer.

At harvest only the genotype Co 13034 and standard check Co 05009 were moderate susceptible (MS) and rest of the genotypes showed less susceptible (LS) to top borer. Standard checks CoJ 64 showed less susceptible(LS) while other genotypes Other check were moderate susceptible (MS).It ranged from 1.94 (CoJ 64) to 3.92 (Co 0238). (Table 8 & 9).

AVT (Mid late) Ratoon

Six genotypes viz., Co 13035, CoPb 13182, CoLk 13204, CoPant 13224, CoH 13263 and CoS 8436 and three standard checks viz., Co 05011, CoS 767 and CoPant 97222 were evaluated against major insect pests of sugarcane.

Based on cummulatie incidence of early shoot borer all the genotypes alongwith standard checks were less susceptible (LS) to early shoot borer. It ranged from 6.83% (CoPant 97222) to 10.50% (CoPant 13224).

At harvest two genotypes viz., CoPant 13224 and CoH 13263 showed moderate susceptible (MS) while rests of the genotypes alongwith standard checks were less susceptible (LS) to top borer. Co 13035 showed less susceptible and rests of the genotypes and standard were less susceptible (LS) to stalk borer. (Table 10 & 11).

AVT (Early) Ratoon

Three genotypes viz., Co 13034, CoPb 13181, and CoS 13231 and three standard checks viz., Co 05009, CoJ 64 and Co 0238 were evaluated against major insect pests.

Based on cumulative incidence of early shoot borer only the genotype Co 13034 was moderate susceptible (MS) and rests of the genotypes alongwith standard checks were less susceptible (LS) to early shoot borer. At harvest, only the genotype CoS 13231 and standard Co 0238 showed moderate susceptible (MS) and rests of the genotypes were less susceptible (LS) to top borer. Genotypes were moderate suseptible (MS) to stalk borer (Table 12 and 13) .

Table 1: Evaluation of zonal varieties /genotypes for their reaction against major insect pests of sugarcane - AVT (Midlate) I Plant

S.N.	Varieties/genotypes	Early shoot borer (% incidence)					No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
1	Co 14035	5.73	4.57	5.32	2.89	10.53	4115
2	CoLk 14203	3.98	3.19	2.74	2.10	7.14	3086
3	CoLk 14204	5.12	3.88	2.76	2.12	6.86	2881
4	CoPb 14184	6.28	3.88	1.93	1.70	6.95	2675
5	CoPb 14185	4.85	6.54	5.64	2.45	11.30	4115
6	CoS 14233	6.32	7.74	8.05	2.01	12.84	5761
7	CoS 14261	5.07	3.90	4.32	1.81	8.43	3086
CK	CoS 767	4.88	5.47	8.76	2.13	16.00	6173
	Co 05011Mid	4.58	4.91	7.35	2.04	8.56	4527
	CoPant 97222 Mid	5.73	3.58	2.53	1.53	6.67	2881
	SE	1.61	1.62	2.49	0.74		
	CD	NS	NS	NS	NS		

Table 2: Evaluation of zonal varieties /genotypes for their reaction against major insect pests of sugarcane - AVT (Mid late) I Plant

S.N.	Varieties/genotypes	Early shoot borer (% incidence)					No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
1	Co 14035	5.73	4.57	5.32	2.89	10.53	4115
2	CoLk 14203	3.98	3.19	2.74	2.10	7.14	3086
3	CoLk 14204	5.12	3.88	2.76	2.12	6.86	2881
4	CoPb 14184	6.28	3.88	1.93	1.70	6.95	2675
5	CoPb 14185	4.85	6.54	5.64	2.45	11.30	4115
6	CoS 14233	6.32	7.74	8.05	2.01	12.84	5761
7	CoS 14261	5.07	3.90	4.32	1.81	8.43	3086
CK	CoS 767	4.88	5.47	8.76	2.13	16.00	6173
	Co 05011	4.58	4.91	7.35	2.04	8.56	4527
	CoPant 97222	5.73	3.58	2.53	1.53	6.67	2881
	SE	1.61	1.62	2.49	0.74		
	CD	NS	NS	NS	NS		

Table 3: Evaluation of zonal varieties /genotypes for their reaction against major insect pests of sugarcane -AVT (Mid late) First Plant

S.No.	Varieties/ genotypes	Top borer (% incidence)			Stalk borer		
		IIIrd brood	IVth brood	At harvest	% incidence	% intensity	Infestation index
		5th month	7th month				
1	Co 14035	2.23	2.08	5.33	30.67	7.50	2.27
2	CoLk 14203	1.97	2.80	4.00	34.67	7.60	2.67
3	CoLk 14204	2.24	1.82	6.67	32.00	6.31	2.27
4	CoPb 14184	1.70	1.97	6.67	38.67	7.28	2.76
5	CoPb 14185	2.48	3.61	8.00	29.33	8.23	2.39
6	CoS 14233	1.58	3.08	6.67	32.00	8.53	2.71
7	CoS 14261	2.96	2.11	10.20	33.33	9.35	3.07
Ck	CoS 767	1.61	2.22	5.33	29.33	7.93	2.38
	Co 05011	1.76	2.04	6.67	40.00	9.03	3.88
	CoPant 97222	1.53	2.53	5.33	33.33	6.90	2.31
	SE	0.80	0.95	1.50	5.20	1.62	0.87
	CD	NS	NS	NS	NS	NS	NS

Table 4: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane- AVT (Mid late) II Plant

S.N.	Varieties/genotypes	Early shoot borer (% incidence)					No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
01	Co 13035	4.29	5.09	4.32	3.26	11.05	3909
02	CoPb 13182	4.64	1.28	5.17	2.63	10.37	3498
03	CoLk 13204	2.76	2.19	2.21	1.54	5.88	3293
04	CoPant 13224	5.26	4.16	2.62	1.58	6.80	2881
05	CoH 13263	4.57	3.91	2.01	1.51	6.19	2675
06	CoS 8436	6.18	6.43	3.11	3.56	10.59	3704
Ck	Co 05011	6.21	3.68	3.71	2.05	8.21	3498
	CoS 767	5.53	4.64	2.27	1.69	7.81	3086
	CoPant 97222	5.85	6.49	2.47	2.03	8.02	2675
	SE	8.20	1.34	1.11	0.79		
	CD	NS	NS	NS	NS		

Table 5: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane-AVT (Mid late) II Plant

S.No.	Varieties/ genotypes	Top borer (% incidence)			Stalk borer		
		IIIrd brood	IVth brood	At harvest	% incidence	% intensity	Infestation index
		5th month	7th month				
01	Co 13035	2.48	1.81	5.33	30.67	5.17	1.60
02	CoPb 13182	4.31	5.50	5.33	42.67	7.85	3.28
03	CoLk 13204	1.54	1.21	4.00	45.33	12.76	5.89
04	CoPant 13224	3.69	2.23	5.33	32.00	7.61	2.43
05	CoH 13263	1.51	2.32	4.00	25.33	6.92	1.79
06	CoS 8436	3.81	3.49	4.00	37.33	10.54	3.91
Ck	Co 05011	1.56	0.99	8.00	37.33	8.75	3.30
	CoS 767	2.70	1.09	6.67	38.67	9.00	3.53
	CoPant 97222	2.43	4.70	8.00	33.33	6.88	2.28
	SE	0.86	1.23	1.66	5.04	1.62	0.84
	CD	1.82	2.61	NS	10.69	3.44	1.77

Table 6: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane-AVT (Early) I Plant

S.No.	Varieties/genotypes	Early shoot borer (% incidence)					No. of bored plants/ha
		45 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
01	Co 14034	4.21	4.08	3.80	0.85	9.35	2675
02	CoPb 14181	3.40	3.84	4.20	1.39	8.60	3909
03	CoLk 14201	4.30	2.18	3.45	2.29	8.64	4321
04	CoPb 14211	6.36	3.95	3.79	2.21	10.77	2881
Ck	Co 05009	5.33	5.51	4.16	2.17	9.93	3086
	CoJ 64	6.08	5.78	4.11	1.72	8.72	3498
	Co 0238	4.66	3.64	3.01	1.28	7.41	2469
	SE	1.08	1.20	1.66	3.44		
	CD	NS	NS	NS	NS		

Table 7: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane-AVT (Early) I Plant

S.N.	Varieties/genotypes	Top borer (% incidence)			Stalk borer		
		IIIrd brood 5th month	IVth brood 7th month	At harvest	% incidence	% intensity	Infestation index
01	Co 14034	2.37	2.89	9.33	36.00	7.94	2.80
02	CoPb 14181	1.96	1.47	6.67	33.33	6.15	2.07
03	CoLk 14201	1.81	1.36	8.00	29.33	7.35	2.24
04	CoPb 14211	2.63	3.35	6.67	25.33	6.55	1.66
Ck	Co 05009	4.30	3.23	10.67	22.67	7.51	1.65
	CoJ 64	1.67	2.74	10.67	29.33	7.35	2.24
	Co 0238	2.70	2.34	6.67	28.00	7.95	2.26
	SE	0.68	0.80	3.01	5.68	1.14	0.55
	CD	1.48	NS	NS	NS	NS	NS

Table 8: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane-AVT (Early) II Plant

S.No.	Varieties/genotypes	Early shoot borer (% incidence)					No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
01	Co 13034	8.25	9.26	5.77	3.31	14.00	4321
02	CoPb 13181	3.83	3.76	8.19	1.87	16.00	6173
03	CoS 13231	4.92	4.65	4.77	1.66	8.50	3898
Ck	Co 05009	4.42	3.70	7.18	2.73	10.17	4938
	CoJ 64	8.23	7.14	4.95	1.99	9.76	3292
	Co 0238	6.76	6.72	5.59	2.61	16.44	5350
	SE	2.61	2.06	2.50	1.00		
	CD	NS	NS	NS	NS		

Table 9: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane-AVT (Early) II Plant

SN	Varieties/genotypes	Top borer (% incidence)			Stalk borer		
		IIIrd brood 5th month	IVth brood 7th month	At harvest	% incidence	% intensity	Infestation index
01	Co 13034	4.00	2.22	10.67	29.33	7.26	2.13
02	CoPb 13181	1.38	2.54	9.33	28.00	7.88	2.27
03	CoS 13231	2.66	4.55	5.33	32.00	8.86	2.61
Ck	Co 05009	2.28	2.18	10.67	33.33	9.20	3.29
	CoJ 64	2.66	3.88	5.33	25.33	7.21	1.94
	Co 0238	3.32	1.82	9.33	42.67	9.72	3.92
	SE	1.02	0.87	3.80	9.31	1.77	0.81
	CD	NS	1.94	NS	NS	NS	N.S.

Table 10: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane -AVT (Mid late) Ratoon

SN	Varieties/genotypes	Early shoot borer (% incidence)					No. of borer plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
01	Co 13035	2.96	4.05	4.47	2.57	9.80	4115
02	CoPb 13182	1.80	1.93	2.87	1.95	6.91	3086
03	CoLk 13204	2.18	3.81	2.83	1.98	8.76	3498
04	CoPant 13224	2.77	4.45	3.99	2.48	10.50	5144
05	CoH 13263	1.86	3.71	3.90	2.08	8.25	3292
06	CoS 8436	2.14	1.72	3.48	2.19	7.11	3292
Ck	Co 05011	1.90	3.23	2.42	2.88	7.52	3498
	CoS 767	1.86	3.06	4.13	1.95	8.37	3704
	CoPant 97222	1.55	2.19	2.41	1.38	6.83	2880
	SE	0.74	0.81	1.40	0.73		
	CD	NS	NS	NS	NS		

Table 11: Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane-AVT (Mid late) Ratoon

SN	Varieties/genotypes	Top borer (% incidence)			Stalk borer		
		IIIrd brood	IVth brood	At harvest	% incidence	% intensity	Infestation index
		5th month	7th month				
01	Co 13035	2.32	3.28	6.67	29.33	6.02	1.78
02	CoPb 13182	1.85	3.62	5.33	25.33	9.91	2.51
03	CoLk 13204	2.65	4.00	8.00	30.67	12.03	3.72
04	CoPant 13224	2.70	3.85	10.33	30.67	7.51	2.31
05	CoH 13263	2.45	2.22	10.33	26.67	11.53	3.07
06	CoS 8436	2.02	3.28	5.33	33.33	7.70	2.57
Ck	Co 05011	1.42	3.17	8.00	30.67	9.51	2.87
	CoS 767	2.89	4.11	8.00	28.00	7.75	2.20
	CoPant 97222	2.07	3.90	8.67	32.00	7.24	2.25
	SE	0.77	2.01	2.92	3.24	1.11	0.43
	CD	NS	NS	NS	NS	NS	0.92

Table 12: Evaluation of zonal varieties /genotypes for their reaction against borer pests of sugarcane -AVT (Early) Ratoon

SN	Varieties/genotypes	Early shoot borer (% incidence)					No. of borer plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cummu.	
1	Co 13034	2.31	4.01	5.26	3.81	13.33	4115
2	CoPb 13181	2.42	2.02	3.21	3.95	11.38	3909
3	CoS 13231	2.15	3.59	3.62	2.66	10.30	3498
Ck	Co 05009	1.00	1.83	2.89	1.55	7.18	3086
	CoJ 64	2.18	2.24	2.95	1.31	6.57	2880
	Co 0238	2.22	2.69	3.79	2.58	9.94	3498
	SE	0.89	0.93	1.26	0.96		
	CD	NS	NS	NS	NS		

Table 13: Evaluation of zonal varieties /genotypes for their reaction against major insect pests of sugarcane -AVT (Early) II Plant Ratoon

S.N.	Varieties/genotypes	Top borer (% incidence)			Stalk borer		
		3rd brood 5th month	4th brood 7th month	At harvest	% incidence	% intensity	Infestation index
1	Co 13034	1.82	2.41	5.33	28.00	13.15	3.60
2	CoPb 13181	1.18	2.14	8.00	34.67	10.23	3.57
3	CoS 13231	2.32	2.50	10.66	29.33	9.41	2.73
Ck	Co 05009	1.57	2.27	9.33	41.33	9.68	3.93
	CoJ 64	2.15	2.69	5.33	29.33	6.99	2.16
	Co 0238	3.32	3.19	10.67	32.00	11.46	3.60
	SE	0.58	0.88	3.10	4.68	2.77	0.60
	CD	NS	NS	NS	NS	NS	NS

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In Advanced Varietal Trial (AVT):

In early maturing group,5+2 sugarcane genotypes viz., CoS 13231 (II plant), Co 14034, CoLk 14201, Co Pb 14211 and two standard (Co 0238 and Co 05009) and in mid late maturing group 12+2 genotypes viz., Co 13035 (II Plant), CoH 13263 (II Plant), CoPb 13182 (II Plant), CoLk 13204 (II Plant), CoPant 13224 (II Plant), CoPb 14035, CoPb 14184, CoPb 14185, CoH 14261, CoLk 14203, CoLk 14204, CoS 14233, and two standards (CoPant 12226 and CoPant 97222,) (Table 1) were planted on March 7-8, 2018 in plots of 3.6 x 6m plot size with 90 cm row to row distance and each treatment was replicated three times. Recommended agronomic practices were followed to raise a good crop. No insecticide was applied at any stage of the crop.

In early group, germination was ranged from 19.33% in Co14034 to 53.55 % in CoS 13231. Incidence of top borer (II Brood) was highest in Co14034 (15.47%) followed by Co 05009 (12.27%), Co 0238 (11.10%) CoLk 14201 (10.52%), CoPb14211 (7.65%) and CoS13231 (7.35%). Highest incidenc of top borer II brood is 15.47 % that comes under MS reaction. Standards received > 10 % and <20 per cent incidence that means standards also fall in MS reaction category. CoLk14201 showed MS reaction and rests of the genotypes showed LS reaction.

Incidence of top borer III was highest in Co 05009 (12.18%), followed by Co 0238 (7.99%), CoLk 14201 (7.98%), Co 14034 (4.62%), CoPb 14211 (4.58%) and CoS 13231 (2.06%). Only one standard Co 05009 showed MS reaction and rest of the genotypes showed LS reaction.

Incidence of top borer (IV Brood) was highest in CoPb 14211 (21.16%) followed by Co 0238 (14.70%), Co 05009 (14.39%), CoLk 14201 (14.25%), Co 14034 (6.36%), and CoS 13231 (5.48%). CoPb 14211 showed HS reaction and two genotypes viz., Co 14034 and CoS 13231were LS.

Incidence stalk borer borer was highest in CoPb 14211 (19.44%) followed by Co 0238 (19.25%), CoLk 14201 (18.33%), CoS 13231, Co 05009 (10.37%) and Co 14034 (6.70%). Cov 14034 showed MS reaction and others showed HS reaction to stalk borer.

Incidence of internode borer was highest in Co0238 (42.80%) followed by CoLk 14201 (34.62%), CoPb 14184 (25.70%), Co 05009 (24.37%), Co 14034 (20.83%). CoPb 14211 (20.55%) and Co 13231 (13.00). Co S13231 showed LS reaction and Co 0238 showed HS reaction and rest of the genotypes showed MS reaction to Internode borer.

Incidence of termites during April-May was highest in Co 14034 (19.72%) followed by CoPb 14211 (8.86%), Co 0238 (8.12%), Co 05009 (6.32%), CoLk 14201 (3.50%) and Co 13231 (3.33).

No incidence of root borer was noticed in two genotypes viz., CoS 13231 and CoLk 14201. It was <1.0% in CoPb14211 and Co 05009. In Co14034 and Co 0238, incidence of root borer was 15.46 and 3.31 per cent, respectively.

Intensity of internode was low in CoPb 14211 (4.72%) and high in Co 14034 (10.9%) and infestation index was low in Co S13231 (0.80) and high in Co 0238 (4.36). Intensity of stalk borer was low in Co14034 ((4.54%) and high in Co 05009 (9.86%) and infestation index was low in Co 14034 (0.30) and high in CoPb 14211(1.74) (Table 2).

Corrected brix, sucrose percent and purity coefficient in the month of November were at par in all the genotypes (Table- 4).

In mid late maturing group, germination ranged from 44.00% in CoPb 14185 to 72.88 % in CoPant 12226. Incidence of top borer (II Brood) was high in CoLk 14204 (11.24%) followed by CoLk 14203 (10.50%). Both of these genotypes showed MS reaction and rest of the genotypes were LS as they have received <10.00 per cent incidence. Incidence of top borer III was higher in CoPb 14035 (11.94%) and rest of the genotypes received <10 incidence come under LS category. Incidence of top borer (IV Brood) was high in CoH 13263 (26.09%) followed by CoPb 14035 (17.33%), CoS 14233 (13.07%), CoLk 14203 (12.74%), CoPb 14185 (12.65%), CoPant 12226 (11.33%) and Co 13035 (10.16%). CoH 13263 showed HS reaction to top borer (IV Brood) and other genotypes viz., CoPb 14035, CoS 14233, CoLk 14203, CoPb 14185, CoPant 12226 and Co13035 showed MS reaction. Rest of the genotypes showed LS reaction.

Incidence stalk borer borer ranged from 6.26 % to 37.33 % and all genotypes were found HS to stalk borer.

Incidence of internode borer was high in CoH 13263 (34.00%) followed by CoS 14233 (33.00%), CoPb 14185 (26.00%), CoPb 14035 (26.00%), Co 13035 (25.33%), CoPb 14184 (23.93%), CoPb 13182 (23.33%), CoPant 97222 (23.17%) and CoLk 14204 (21.33) (Table-5 &6) and all these genotypes showed MS reaction to internode borer and rest of the genotypes were LS.

Intensity of internode was low in CoPant 12226 (5.79%) and high in CoPb 14185 (8.15%) and infestation index was low in CoH 13231 (0.31) and high in CoH 13263 (2.52). Intensity of stalk borer was low in CoPant 97222 (4.01%) and high in CoPant 13224 (12.13%) and infestation index was low in CoPb13182 (0.34) and high in CoPant 13224 (2.86) (Table 5).

Incidence of termites and root borer during April-May was low. In case of termites it ranged from 0.00 % to 7.66 per cent and 0.00% to 2.86 % in case of root borer.

Corrected brix, sucrose percent and purity coefficient in the month of November were at par in all the genotypes (Table-7).

Table-1: List of genotypes evaluated (AVT)

S.N.	**Early maturing**	**S.N.**	**Mid late maturing**
First Plant		**First Plant**	
1	CoLk 14201	1	CoLk14203
2	Co 14034,	2	CoLk14204
3	Co Pb14211	3	CoH14261
Second Plant		4	CoPb14035
4	CoS 13231	5	CoPb14184
Standards		7	CoPb14185
5	Co 0238	8	CoS14233
6	Co 05009	Second Plant	
		9	CoLk13204
		10	Co13035
		11	CoH13263
		12	CoPb13182
		13	CoPant13224
		Standard	
		14	CoPant 12226
		15	CoPant 97222

Table-2: Incidence of insect pests in early maturing genotypes (AVT)

S. N	Variety	Incidence of top borer			Stalk borer			Internode Borer		
		II brood	III brood	IV brood	Incidence (%)	Intensity (%)	Infestation index	Incidence (%)	Intensity (%)	Infestation index
1	CoLk14201	10.52	7.98	14.25	18.33	8.86	1.62	34.62	6.48	2.24
2	CoS 13231	7.35	2.06	5.48	12.51	8.09	1.01	13.0	6.19	0.80
3	Co14034	15.47	4.62	6.36	6.70	4.54	0.30	20.83	10.91	2.27
4	Co Pb14211	7.65	4.58	21.16	19.44	8.94	1.74	20.55	4.72	0.96
5	Co0238	11.10	7.99	14.39	19.25	8.69	1.68	42.80	10.20	4.36
6	Co5009	12.27	12.18	14.70	10.37	9.86	1.02	24.37	8.95	2.18

Table: 3. Reaction of sugarcane genotypes (Early maturing) against top borer and internode borer (AVT)

Insect pests	Scale (% incidence)	Reaction	No. of genotype	Genotype
Top Borer II Brood	<10.0	LS	3	CoS 13231, Co Pb14211
	10.1-20.0	MS	4	CoLk14201, Co14034, Co0238, Co5009
	>20.0	HS	-	-
Top borer III Brood	<10.0	LS	6	CoLk14201, CoS 13231, Co14034, Co Pb14211, Co0238
	10.1-20.0	MS	1	Co05009
	>20.0	HS	-	
Top borer IV Brood	<10.0	LS	2	CoS 13231 Co14034
	10.1-20.0	MS	5	CoLk14201, Co5009 , Co Pb14211, Co0238
	>20.0	HS	-	-
Internode borer	<20.0	LS	1	CoS 13231
	20.1-40.0	MS	6	CoLk14201, Co5009, , Co Pb14211, Co0238, Co14034
	>40.0	HS	-	-
Stalk borer	<2.0	LS	-	-
	2.1-5.0	MS	-	-
	>5.0	HS	7	CoLk14201, Co05009, Co Pb14211, Co0238, Co14034, CoS 13231

Table-4: Quality parameters and cane yield in early maturing group

S.N	**Variety**	**Quality parameters**		
		Corrected Brix	**Sucrose (%)**	**Purity Coefficient**
1	**CoLk14201**	21.33	19.15	89.81
2	**CoS 13231**	21.72	19.60	90.28
3	**Co14034**	21.64	19.48	89.91
4	**Co Pb14211**	21.87	19.80	90.59
5	**Co0238**	21.56	19.43	90.14
6	**Co05009**	21.47	19.30	89.91

Table-5: Incidence of insect pests in mid late maturing genotypes (AVT)

S.N	Variety		Incidence of top borer		Stalk borer			Internode Borer		
		II Brood	III brood	IV brood	Incidence (%)	Intensity (%)	Infestation index	Incidence (%)	Intensity (%)	Infestation index
II Plant										
1	CoLk13204	8.56	3.44	7.33	26.00	8.41	2.18	19.33	7.21	1.39
2	Co13035	6.84	3.73	10.16	23.00	7.02	1.61	25.33	7.82	1.98

3	COH13263	7.45	6.68	26.09	14.95	8.68	1.29	34.00	7.40	2.52
4	CoPb13182	7.89	9.78	10.00	6.26	5.46	0.34	23.33	7.37	1.71
5	CoPant13224	6.15	3.73	8.00	23.66	12.13	2.86	18.67	7.70	1.44
I Plant										
6	CoLk14203	10.50	3.44	12.74	11.11	7.68	0.85	15.11	5.93	0.89
7	CoLk14204	11.24	4.95	6.67	16.67	8.91	1.48	21.33	6.25	1.33
8	CoH14261	7.49	6.14	6.00	12.00	6.01	0.72	5.77	5.31	0.31
9	CoPb14035	7.19	11.94	17.33	10.67	6.00	0.64	26.00	8.59	2.23
10	CoPb14184	9.20	6.45	5.04	20.12	7.55	1.52	23.93	6.34	1.52
11	CoPb14185	8.48	4.09	12.65	18.87	11.37	2.14	26.08	8.15	2.12
12	CoS14233	4.70	2.98	13.07	12.67	8.44	1.07	33.00	7.50	2.47
13	CoPant97222	9.20	6.44	7.12	10.74	4.01	0.43	23.17	6.23	1.44
14	CoPant12226	8.80	5.29	11.33	18.67	9.78	1.82	17.33	5.79	1.00

Table: 6. Reaction of sugarcane genotypes (Mid-late maturing) against top borer and internode borer (AVT)

Insect pests	Scale (% incidence)	Reaction	Genotype
Top borer II brood	<10.0%	LS	CoLk13204, Co13035, Co13035, CoPb13182, CoPant13224, CoPant12226, CoH14261, CoPb14035, CoPb14184, CoPb14185, CoS14233, CoPant97222
	10.1-20.0	MS	CoLk14203, CoLk14204,
	>20.0	HS	-
Top borer III Brood	<10.0%	LS	CoLk13204, Co13035, Co13035, CoPb13182, CoPant13224, CoPant12226, CoH14261, CoPb14184, CoPb14185, CoS14233, CoPant97222 ,CoLk14203, CoLk14204
	10.1-20.0	MS	CoPb14035
	>20.0	HS	-
Top borer IV Brood	<10.0%	LS	CoLk13204, CoPant13224, CoLk14204, CoH14261, CoPb14184, CoPant97222
	10.1-20.0	MS	Co13035, CoPb13182, CoPant12226 ,CoLk14203, CoPb14035, CoPb14185, CoS14233
	>20.0	HS	Co13035
Internode borer	<20.0	LS	CoLk13204, CoPant13224, CoPant12226, CoLk14203, CoH14261, CoPb14184, CoPant97222, CoPb13182,
	20.1-40.0	MS	Co13035, Co13035, CoPb13182, CoLk14204, CoPb14035, CoPb14184, CoPb14185 , CoS14233
	>40.0	HS	-
Stalk borer	<2.0	LS	-
	2.1-5.0	MS	-
	>5.0	HS	CoLk13204, CoPant13224 ,CoPant12226, CoLk14203, CoH14261,**Co13035,** Co13035, CoPb13182, CoLk14204, CoPb14035, CoPb14184, CoPb14185, CoS14233, CoPant97222

Table-7: Quality parameters and cane yield in mid late group

S.N	**Variety**	**Quality parameters**		
		Corrected Brix	**Sucrose (%)**	**Purity Coefficient**
II Plant				
1	CoLk13204	19.48	17.04	87.38
2	Co13035	20.72	18.66	90.08
3	CoH13263	20.14	18.17	90.11
4	CoPb13182	20.6	18.60	90.00
5	CoPant13224	20.33	18.45	90.74
I Plant				
6	CoLk14203	20.85	18.66	90.15
7	CoLk14204	18.96	16.87	88.87

8	CoH14261	21.30	19.29	90.55
9	CoPb14035	20.95	18.95	90.43
10	CoPb14184	19.54	17.60	90.13
11	CoPb14185	20.50	18.90	90.51
12	CoS14233	20.50	18.52	90.13
13	CoPant97222	20.50	18.47	90.09
14	CoPant12226	20.58	18.50	89.89

Peninsular Zone

DR. PDKV, Akola

Table -1: Reaction of Sugarcane varieties/genotypes to major insect pests in IVT Early I Plant

Sr. No.	Genotypes	ESB at 30 DAP		ESB at 60 DAP		ESB at 90 DAP		ESB at 120 DAP	
		Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction
1	Co 14005	6.72	LS	6.54	LS	5.34	LS	5.69	LS
2	Co 15002	6.44	LS	7.14	LS	4.53	LS	5.90	LS
3	Co 15005	5.61	LS	9.83	LS	5.88	LS	8.81	LS
4	Co 15006	6.11	LS	7.77	LS	5.03	LS	4.84	LS
5	Co 15007	5.64	LS	7.62	LS	4.88	LS	5.63	LS
6	CoSnK 15101	4.81	LS	6.63	LS	4.73	LS	5.50	LS
7	CoSnk 15102	5.64	LS	5.11	LS	3.39	LS	5.49	LS
8	CoVSI 15121	4.70	LS	6.50	LS	3.82	LS	4.76	LS
9	Co 15009	5.52	LS	5.86	LS	3.82	LS	5.58	LS
10	Co 15010	6.62	LS	5.45	LS	4.06	LS	5.71	LS
11	Co 15015	17.78	**MS**	6.42	LS	4.03	LS	5.09	LS
12	Co 15017	9.63	LS	6.40	LS	5.05	LS	5.60	LS
13	Co 15018	10.47	LS	8.67	LS	4.66	LS	6.19	LS
14	Co 15020	5.52	LS	7.13	LS	3.38	LS	5.70	LS
15	Co 15021	5.47	LS	4.29	LS	2.93	LS	5.81	LS
16	CoN 15071	3.69	LS	6.83	LS	5.17	LS	5.03	LS
17	CoN 15072	10.62	LS	6.33	LS	4.84	LS	5.34	LS
18	CoSnk 15103	7.69	LS	7.63	LS	4.28	LS	5.44	LS
19	CoSnk 15104	9.30	LS	9.06	LS	4.71	LS	4.31	LS
20	CoVC 15061	4.04	LS	7.92	LS	4.31	LS	4.60	LS
21	CoVC 15062	6.77	LS	5.82	LS	4.88	LS	5.05	LS
22	CoVC 15063	5.44	LS	4.47	LS	4.08	LS	5.72	LS
23	CoVC 15064	7.83	LS	7.34	LS	4.38	LS	5.33	LS
24	PI 15131	6.29	LS	6.30	LS	4.92	LS	5.62	LS
25	PI 15132	5.12	LS	4.97	LS	6.81	LS	5.11	LS
26	VSI 15122	5.79	LS	4.28	LS	6.15	LS	6.04	LS
27	Co 86032	5.31	LS	7.39	LS	4.84	LS	5.30	LS
28	CoC 671	9.81	LS	6.50	LS	4.62	LS	6.08	LS
29	CoSnk 05103	4.73	LS	7.91	LS	4.88	LS	5.30	LS
30	Co 85004	4.64	LS	6.67	LS	4.57	LS	6.05	LS

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades LS = Below 15.0 MS= 15.1 to 30.0 HS = above 30.0

Table -2: Reaction of Sugarcane varieties/genotypes to scales in IVT Early Plant at Harvest

Sr. No.	Genotypes	Scales		
		% incidence	% intensity	Reaction
1	Co 14005	40.00	10.26	**HS**
2	Co 15002	40.00	9.94	HS
3	Co 15005	30.00	10.21	MS
4	Co 15006	20.00	10.03	MS
5	Co 15007	40.00	8.45	**HS**
6	CoSnK 15101	20.00	6.69	MS
7	CoSnk 15102	50.00	6.27	**HS**
8	CoVSI 15121	60.00	6.30	**HS**
9	Co 15009	50.00	5.35	**HS**
10	Co 15010	40.00	5.52	**HS**
11	Co 15015	40.00	5.68	**HS**
12	Co 15017	70.00	6.78	**HS**
13	Co 15018	20.00	7.68	MS
14	Co 15020	60.00	7.75	**HS**
15	Co 15021	50.00	8.06	**HS**
16	CoN 15071	30.00	6.84	MS
17	CoN 15072	50.00	10.42	**HS**
18	CoSnk 15103	20.00	17.45	MS
19	CoSnk 15104	40.00	8.82	**HS**
20	CoVC 15061	40.00	8.79	**HS**
21	CoVC 15062	30.00	8.70	MS
22	CoVC 15063	30.00	8.40	MS
23	CoVC 15064	30.00	7.69	MS
24	PI 15131	30.00	7.87	MS
25	PI 15132	50.00	6.99	**HS**
26	VSI 15122	50.00	6.93	**HS**
27	Co 86032	30.00	7.16	MS
28	CoC 671	40.00	7.91	**HS**
29	CoSnk 05103	50.00	7.35	**HS**
30	Co 85004	30.00	8.06	MS

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades: LS= below 10, MS= 10.1 – 35, HS= Above 35

Table-3: Reaction of Sugarcane varieties/genotypes to major insect pests in AVT I Plant

Sr. No.	Genotypes	ESB at 30 DAP		ESB at 60 DAP		ESB at 90 DAP		ESB at 120 DAP	
		Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction
1	Co 13002	18.61	**MS**	11.00	LS	14.76	LS	8.89	LS
2	Co 13003	10.69	LS	9.35	LS	9.77	LS	9.92	LS
3	Co 13004	13.36	LS	11.94	LS	8.93	LS	10.26	LS
4	CoN 13072	15.97	**MS**	12.22	LS	10.86	LS	13.70	LS
5	CoSnk 13101	15.58	**MS**	13.21	LS	10.81	LS	10.93	LS
6	MS 13081	13.35	LS	11.85	LS	9.66	LS	8.73	LS
7	Co 13006	13.02	LS	9.68	LS	8.98	LS	9.75	LS
8	Co 13008	15.69	**MS**	17.00	**MS**	11.36	LS	9.52	LS
9	Co 13009	11.52	LS	10.72	LS	10.45	LS	10.64	LS

10	Co 13013	18.84	**MS**	11.96	LS	11.94	LS	10.33	LS
11	Co 13014	15.28	**MS**	10.61	LS	11.01	LS	11.65	LS
12	Co 13018	13.62	LS	12.96	LS	16.23	**MS**	11.24	LS
13	Co 13020	15.28	**MS**	12.01	LS	15.16	**MS**	12.19	LS
14	CoN 13073	17.26	**MS**	12.24	LS	15.30	**MS**	13.98	LS
15	CoSnk 13103	14.85	LS	12.69	LS	13.40	LS	15.71	LS
16	CoSnk 13106	14.14	LS	15.63	**MS**	13.41	LS	14.62	LS
17	PI 13132	14.53	LS	10.61	LS	14.57	LS	14.36	LS
18	Co 86032	16.78	**MS**	11.02	LS	14.48	LS	14.64	LS
19	CoC 671	16.48	**MS**	11.14	LS	14.43	LS	13.78	LS
20	CoSnk 05103	16.80	**MS**	11.24	LS	13.78	LS	16.11	**MS**

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades LS = Below 15.0 MS= 15.1 to 30.0 HS = above 30.0

Table-4: Reaction of Sugarcane varieties/genotypes to scales insect in AVT I Plant at Harvest

Sr. No.	Genotypes	Scales		
		% incidence	% intensity	Reaction
1	Co 13002	30.00	9.76	MS
2	Co 13003	40.00	9.58	**HS**
3	Co 13004	30.00	8.91	MS
4	CoN 13072	30.00	9.69	MS
5	CoSnk 13101	40.00	8.18	**HS**
6	MS 13081	30.00	6.87	MS
7	Co 13006	40.00	6.16	**HS**
8	Co 13008	40.00	6.22	**HS**
9	Co 13009	40.00	5.26	**HS**
10	Co 13013	40.00	5.26	**HS**
11	Co 13014	20.00	6.03	MS
12	Co 13018	20.00	5.96	MS
13	Co 13020	30.00	5.93	MS
14	CoN 13073	20.00	8.71	MS
15	CoSnk 13103	30.00	6.05	MS
16	CoSnk 13106	30.00	5.85	MS
17	PI 13132	10.00	6.28	LS
18	Co 86032	20.00	6.19	MS
19	CoC 671	10.00	6.40	LS
20	CoSnk 05103	30.00	6.80	MS

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades: LS= below 10, MS= 10.1 – 35, HS= Above 35

Table-5: Reaction of Sugarcane varieties/genotypes to *Pyrilla perpusilla* (Nymph & Adults) per leaf in AVT I Plant

Sr. No.	Genotypes	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction
1	Co 13002	0.77	LS	0.93	LS	0.62	LS	0.67	LS
2	Co 13003	0.93	LS	1.05	LS	0.78	LS	0.62	LS
3	Co 13004	0.65	LS	1.08	LS	0.50	LS	0.43	LS
4	CoN 13072	0.75	LS	0.88	LS	0.57	LS	0.68	LS
5	CoSnk 13101	0.63	LS	0.87	LS	0.55	LS	0.63	LS

6	MS 13081	0.98	LS	0.98	LS	0.85	LS	0.78	LS
7	Co 13006	0.43	LS	0.67	LS	0.27	LS	0.37	LS
8	Co 13008	1.03	LS	1.20	LS	0.75	LS	0.83	LS
9	Co 13009	0.65	LS	0.70	LS	0.50	LS	0.48	LS
10	Co 13013	0.90	LS	1.03	LS	0.58	LS	0.82	LS
11	Co 13014	0.47	LS	0.68	LS	0.35	LS	0.43	LS
12	Co 13018	0.35	LS	0.58	LS	0.25	LS	0.50	LS
13	Co 13020	0.33	LS	0.50	LS	0.22	LS	0.43	LS
14	CoN 13073	0.45	LS	0.48	LS	0.28	LS	0.33	LS
15	CoSnk 13103	0.42	LS	0.57	LS	0.38	LS	0.38	LS
16	CoSnk 13106	0.57	LS	0.65	LS	0.42	LS	0.28	LS
17	PI 13132	0.65	LS	0.55	LS	0.42	LS	0.48	LS
18	Co 86032	0.63	LS	0.53	LS	0.30	LS	0.37	LS
19	CoC 671	0.62	LS	0.52	LS	0.33	LS	0.42	LS
20	CoSnk 05103	0.53	LS	0.57	LS	0.38	LS	0.45	LS

LS = Less susceptible Below 5, MS= Moderately susceptible 5.1-20.0 and HS = Highly Susceptible Above 20.

Early Shoot Borer: Infestation of early shoot borer at 30 DAP, 60 DAP, 90 DAP and 120 DAP was ranged from 10.69 to 18.84%, 9.35 to 15.63%, 9.77 to 14.76% and 8.89 to 16.11%, respectively. The data revealed that the entries, Co 13002, CoN 13072, CoSnk 13101, Co 13008, Co 13013, Co 13014, Co 13020, CoN 13073, Co 86032, CoC 671 and CoSnk 05103 were moderately susceptible (MS) whereas, the remaining entries were found less susceptible (LS). (Table-1).

Scale insect: The infestation of the scales was ranging from 10.00 to 40.00%. The data revealed that varieties Co 13003, CoSnk 13101, Co 13006, Co 13008, Co 13009 and Co 13013 were Highly susceptible (HS) and remaining varieties were moderately susceptible (MS) and PI 13132 was less susceptible (LS).(Table-2).

***Pyrilla perpusilla*:** Infestation of *Pyrilla* in all varieties was ranging from 0.28 to 1.20 per leaf at 15 days interval revealed that all entries were less susceptible (LS).(Table-5).

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Table-6: Reaction of Sugarcane varieties/genotypes to *Pyrilla* (Nymph & Adults) per leaf in IVT Early Plant

Sr. No.	Genotypes	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction
1	Co 14005	0.95	LS	1.35	LS	0.93	LS	0.65	LS
2	Co 15002	2.00	LS	1.75	LS	1.93	LS	1.25	LS
3	Co 15005	1.03	LS	1.15	LS	0.93	LS	0.75	LS
4	Co 15006	1.48	LS	1.75	LS	1.38	LS	1.15	LS
5	Co 15007	1.18	LS	1.00	LS	1.10	LS	0.80	LS
6	CoSnK 15101	2.00	LS	1.60	LS	1.93	LS	1.23	LS
7	CoSnk 15102	1.48	LS	2.20	LS	1.33	LS	1.28	LS
8	CoVSI 15121	1.83	LS	2.05	LS	1.50	LS	1.43	LS
9	Co 15009	2.00	LS	1.90	LS	1.78	LS	1.48	LS
10	Co 15010	2.00	LS	1.75	LS	1.93	LS	1.20	LS
11	Co 15015	2.23	LS	1.70	LS	1.85	LS	1.38	LS
12	Co 15017	1.10	LS	1.38	LS	0.58	LS	0.78	LS
13	Co 15018	0.88	LS	0.83	LS	0.48	LS	0.55	LS

14	Co 15020	0.85	LS	1.20	LS	0.58	LS	0.65	LS
15	Co 15021	1.90	LS	1.65	LS	1.65	LS	1.15	LS
16	CoN 15071	0.93	LS	1.05	LS	0.73	LS	0.85	LS
17	CoN 15072	1.38	LS	1.65	LS	1.20	LS	1.15	LS
18	CoSnk 15103	1.08	LS	0.90	LS	0.90	LS	0.88	LS
19	CoSnk 15104	1.75	LS	1.50	LS	1.58	LS	1.28	LS
20	CoVC 15061	1.38	LS	2.10	LS	1.10	LS	1.35	LS
21	CoVC 15062	1.73	LS	1.95	LS	1.48	LS	1.43	LS
22	CoVC 15063	1.90	LS	1.80	LS	1.55	LS	1.58	LS
23	CoVC 15064	1.90	LS	1.65	LS	1.68	LS	1.20	LS
24	PI 15131	2.13	LS	1.73	LS	1.65	LS	1.40	LS
25	PI 15132	1.00	LS	1.35	LS	0.83	LS	0.83	LS
26	VSI 15122	0.78	LS	0.83	LS	0.45	LS	0.75	LS
27	Co 86032	0.85	LS	1.20	LS	0.58	LS	0.65	LS
28	CoC 671	1.90	LS	1.55	LS	1.68	LS	1.00	LS
29	CoSnk 05103	0.93	LS	1.18	LS	0.75	LS	0.63	LS
30	Co 85004	1.38	LS	1.60	LS	1.18	LS	1.15	LS

LS = Less susceptible Below 5, MS= Moderately susceptible 5.1-20.0 and HS = Highly Susceptible Above 20.

Early Shoot Borer: Infestation of early shoot borer at 30 DAP, 60 DAP, 90 DAP and 120 DAP was ranged from 3.69 to 17.78%, 4.28 to 9.83%, 2.93 to 6.81% and 4.31 to 6.31%, respectively. The data revealed that all the entries were found Less susceptible (LS) at except Co15015 it was moderately susceptible (MS).(Table-3).

Scales: The infestation of the scales was ranging from 20 to 70%.The data revealed that seven varieties were found moderately susceptible (MS) and 33 varieties were found highly susceptible (HS). (Table-4).

***Pyrilla*:** the infestation of *Pyrilla* in all varieties was ranging from 0.55 to 2.20 per leaf indicating less susceptible genotypes. (Table-5).

Table-7: Reaction of Sugarcane varieties/genotypes to major insect pests in AVT Early II Plant

Sr. No.	Genotypes	ESB at 30 DAP		ESB at 60 DAP		ESB at 90 DAP		ESB at 120 DAP	
		Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction
1	Co 12007	12.53	LS	11.19	LS	11.59	LS	5.84	LS
2	Co 12008	13.77	LS	10.98	LS	9.04	LS	5.96	LS
3	Co 12009	14.51	LS	11.58	LS	10.62	LS	4.89	LS
4	Co 12012	13.43	LS	11.02	LS	7.96	LS	5.36	LS
5	Co 12019	14.41	LS	9.62	LS	9.25	LS	5.85	LS
6	Co 12024	14.69	LS	10.46	LS	17.60	**MS**	5.78	LS
7	CoM 12085	15.10	**MS**	10.01	LS	9.81	LS	6.17	LS
8	VSI 12121	14.78	LS	12.55	LS	9.34	LS	10.40	LS
9	Co 86032	14.60	LS	12.31	LS	11.28	LS	8.70	LS
10	CoC 671	13.93	LS	12.81	LS	14.53	LS	8.10	LS
11	CoSnk 05103	13.87	LS	12.23	LS	12.64	LS	10.44	LS

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades LS = Below 15.0 MS= 15.1 to 30.0 HS = above 30.0

Table-8: Reaction of Sugarcane varieties/genotypes to scales in AVT Early II Plant at Harvest

Sr. No.	Genotypes	Scales		
		% incidence	% intensity	Reaction
1	Co 12007	30.00	9.24	MS
2	Co 12008	30.00	8.76	MS
3	Co 12009	30.00	9.51	MS
4	Co 12012	40.00	8.99	**HS**
5	Co 12019	30.00	7.73	MS
6	Co 12024	20.00	7.48	MS
7	CoM 12085	10.00	6.70	LS
8	VSI 12121	30.00	6.34	MS
9	Co 86032	20.00	6.67	MS
10	CoC 671	30.00	6.34	MS
11	CoSnk 05103	20.00	7.03	MS

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades: LS= below 10, MS= 10.1 – 35, HS= Above 35

Table-9: Reaction of Sugarcane varieties/genotypes to *Pyrilla* (Nymph & Adults) per leaf in AVT Early II Plant

Sr. No.	Genotypes	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction
1	Co 12007	0.55	LS	0.70	LS	0.65	LS	0.75	LS
2	Co 12008	0.78	LS	0.88	LS	0.75	LS	1.00	LS
3	Co 12009	0.75	LS	0.95	LS	0.90	LS	0.95	LS
4	Co 12012	0.68	LS	0.78	LS	0.83	LS	0.75	LS
5	Co 12019	0.65	LS	0.88	LS	0.75	LS	0.98	LS
6	Co 12024	0.78	LS	1.15	LS	1.10	LS	1.08	LS
7	CoM 12085	0.93	LS	1.35	LS	0.75	LS	1.03	LS
8	VSI 12121	0.73	LS	0.85	LS	0.60	LS	0.85	LS
9	Co 86032	0.70	LS	0.73	LS	0.60	LS	0.70	LS
10	CoC 671	0.58	LS	0.60	LS	0.70	LS	0.75	LS
11	CoSnk 05103	0.60	LS	0.70	LS	0.58	LS	0.65	LS

LS = Less susceptible Below 5, MS= Moderately susceptible 5.1-20.0 and HS = Highly Susceptible Above 20.

Early Shoot Borer: The early shoot borer infestation at 30 DAP, 60 DAP , 90 DAP and 120 DAP was ranged from 12.53 to 15.10 %, 9.62 to 12.81%, 7.96 to 17.60% and 4.89 to 10.44%, respectively. The data revealed that the entries CoM12085 was found to be moderately susceptible (MS) whereas, the remaining entries were found less susceptible (LS). (Table-7).

Scales: The infestation of the scales was ranging from 10.00 to 40.00% and Co12012 was found highly susceptible (HS) and remaining varieties were moderately susceptible (MS) and CoM 12085 was less susceptible (LS). (Table -8).

***Pyrilla*:** The data of *Pyrilla* at 15 days interval revealed that all the eleven entries showed less susceptible reaction to *Pyrilla.* (Table-9)

Table-10: Reaction of Sugarcane varieties/genotypes to major insect pests in AVT ratoon Plant at 30, 60, 90 and 120 DAP.

Sr. No.	Genotypes	ESB at 30 DAP		ESB at 60 DAP		ESB at 90 DAP		ESB at 120 DAP	
		Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction	Average % Infestation	Reaction
1	Co 12007	15.22	**MS**	9.52	LS	8.05	LS	8.65	LS
2	Co 12008	9.40	LS	9.05	LS	8.90	LS	11.84	LS
3	Co 12009	9.34	LS	8.70	LS	10.26	LS	10.93	LS
4	Co 12012	9.30	LS	9.90	LS	10.14	LS	10.71	LS
5	Co 12019	8.49	LS	9.27	LS	8.97	LS	8.57	LS
6	Co 12024	11.26	LS	9.25	LS	7.13	LS	7.03	LS
7	CoM 12085	14.95	LS	9.65	LS	8.64	LS	10.04	LS
8	VSI 12121	9.94	LS	10.78	LS	12.46	LS	18.21	**MS**
9	Co 86032	10.44	LS	11.01	LS	12.51	LS	17.23	**MS**
10	CoC 671	11.29	LS	10.36	LS	11.84	LS	15.54	**MS**
11	CoSnk 05103	10.17	LS	12.24	LS	12.64	LS	16.02	**MS**

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades LS = Below 15.0 MS= 15.1 to 30.0 HS = above 30.0

Table-11: Reaction of Sugarcane varieties/genotypes to scales in AVT ratoon Plant at Harvest

Sr. No.	Genotypes	Scales		
		% incidence	% intensity	Reaction
1	Co 12007	30.00	10.15	MS
2	Co 12008	20.00	9.54	MS
3	Co 12009	30.00	10.60	MS
4	Co 12012	30.00	10.03	MS
5	Co 12019	30.00	9.05	MS
6	Co 12024	20.00	7.70	MS
7	CoM 12085	10.00	7.50	LS
8	VSI 12121	30.00	7.20	MS
9	Co 86032	30.00	7.21	MS
10	CoC 671	20.00	7.12	MS
11	CoSnk 05103	20.00	7.36	MS

LS = Less susceptible, MS= Moderately susceptible and HS = Highly susceptible.
Grades: LS= below 10, MS= 10.1 – 35, HS= Above 35

Table-12: Reaction of Sugarcane varieties/genotypes to *Pyrilla* (Nymph & Adults) per leaf in AVT ratoon

Sr. No.	Genotypes	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction	*Pyrilla* (Nymph & Adults) per leaf	Reaction
1	Co 12007	0.68	LS	1.10	LS	0.75	LS	0.97	LS
2	Co 12008	0.65	LS	1.08	LS	0.77	LS	0.73	LS
3	Co 12009	0.68	LS	1.08	LS	0.82	LS	0.85	LS
4	Co 12012	0.70	LS	0.92	LS	0.78	LS	0.80	LS
5	Co 12019	0.90	LS	0.82	LS	0.93	LS	0.77	LS
6	Co 12024	0.87	LS	0.85	LS	0.82	LS	0.73	LS
7	CoM 12085	0.67	LS	0.80	LS	0.73	LS	0.72	LS
8	VSI 12121	0.50	LS	0.77	LS	0.57	LS	0.72	LS

9	Co 86032	0.52	LS	0.70	LS	0.48	LS	0.67	LS
10	CoC 671	0.48	LS	0.78	LS	0.53	LS	0.57	LS
11	CoSnk 05103	0.55	LS	0.77	LS	0.45	LS	0.60	LS

LS = Less susceptible Below 5, MS= Moderately susceptible 5.1-20.0 and HS = Highly Susceptible Above 20.

Early Shoot Borer: The early shoot borer infestation at 30 DAP, 60 DAP , 90 DAP and 120 DAP was ranged from 8.49 to 15.22%, 8.70 to 12.24%, 7.13 to 12.64% and 8.65 to 18.21%, respectively. The data revealed that the entries Co12007 was found to be moderately susceptible (MS) whereas, the remaining entries were found less susceptible. At the age of 120 days, VSI 12121, Co 86032, CoC 671 and CoSnk 05103 were found moderately susceptible (MS) and remaining entries were found less susceptible (LS). (Table-10).

Scales: The infestation of the scales was ranging from 10.00 to 30.00%. Variety CoM 12085 was less susceptible (LS) and remaining varieties were moderately susceptible (MS). (Table-11).

***Pyrilla*:** The data of *Pyrilla* at 15 days interval revealed that all the entries showed less susceptible reaction to *Pyrilla*. (Table-12)

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Cumulative shoot borer incidence in IVT entries ranged from 4.7% (Co 15006) to a maximum of 49.7% (PI 15132) .Out of 27 entries screened fall under LS category, 12 entries under MS category and the rest seven under HS category. Least number of bored shoots was recorded in the entry Co 15006 (1235/ha) and the maximum bored shoots were recorded in the entry CoVC 15062(18724/ha).

Table-1: Incidence of shoot borer in IVT I Plant

S. No	Entry	%Incidence					
		30DAP	60DAP	90DAP	Cumulative incidence	No. Of Bored plants\ha	Infestation Index
1	Co14005	5.88	11.04	12.70	18.35	14198	MS
2	Co15002	11.48	4.76	2.87	13.53	7407	LS
3	Co15005	4.31	9.82	3.20	6.52	3086	LS
4	Co15006	10.98	8.61	6.83	4.72	1235	LS
5	Co15007	41.10	28.75	11.54	41.40	13374	HS
6	Co15009	17.12	7.09	9.42	14.15	6173	LS
7	Co15010	21.05	8.96	4.90	31.41	10082	HS
8	Co15015	20.26	12.91	6.51	31.63	19136	HS
9	Co15017	11.73	42.32	8.41	37.58	12140	HS
10	Co15018	12.45	10.13	6.25	11.26	6790	LS
11	Co15020	7.86	8.49	4.02	15.63	12346	MS
12	Co15021	22.98	17.87	10.61	26.11	9671	MS
13	CoN15071	21.57	7.90	6.72	17.00	10494	MS
14	CoN15072	17.39	34.21	10.64	38.24	5350	HS
15	CoSnk15101	6.90	9.64	9.80	24.59	3086	MS
16	CoSnk15102	7.76	15.84	8.03	18.22	8436	MS
17	CoSnk15103	18.73	6.13	9.66	17.33	10700	MS
18	CoVC15061	11.39	4.76	2.05	16.37	5761	MS
19	CoVC15061	11.39	21.62	6.80	17.24	10288	MS
20	CoVC15062	11.02	29.18	5.25	22.92	18724	MS
21	CoVC15063	10.10	15.68	4.86	10.64	8230	LS
22	CoVC15064	10.18	11.60	7.05	27.50	11317	MS
23	PI 15131	30.23	64.56	13.58	41.18	10082	HS
24	PI 15132	23.36	22.12	9.02	49.70	17284	HS
25	VS 11512	12.06	7.50	4.00	11.86	7202	LS
26	VS 115122	8.20	12.52	7.34	17.56	4733	MS
27	Co86032	8.10	8.74	2.44	9.12	6379	LS

Table -2: Shoot Borer Incidence in AVT- I Plant

S. No	Entry	% Incidence				No. of bored plants/ha	Infestation Index
		30 DAP	60 DAP	90 DAP	Cumulative incidence		
1	Co13002	11.95	24.26	3.4	41.00	2459	HS
2	Co13003	6.91	11.59	3.38	16.89	1423	MS
3	Co13004	5.00	8.06	12.77	25.45	1029	MS
4	Co13006	11.38	15.32	4.89	26.77	2342	MS
5	Co13008	4.85	25.36	8.02	42.86	998	HS
6	Co13009	9.12	18.88	7.94	20.74	1876	MS
7	Co13013	3.85	13.22	4.88	14.21	792	LS
8	Co13014	9.55	21.57	1.51	35.85	1964	HS
9	Co13018	16.62	27.10	7.47	36.50	3420	HS
10	Co13020	12.90	25.30	7.61	37.30	2655	HS
	CoN13072	18.52	20.12	7.34	18.49	3810	MS
12	CoN13073	5.84	17.86	9.88	33.64	1203	HS
13	CoSnk13101	5.86	17.02	10.46	49.35	1205	HS
14	CoSnk13103	5.17	6.60	3.6	15.72	1064	MS
15	CoSnk13106	17.97	22.99	5.31	31.34	3698	HS
16	MS13081	6.10	36.76	7.58	39.60	1255	HS
17	P113132	11.44	26.81	6.13	35.39	2353	HS
18	CoC671	15.73	21.94	3.57	25.76	3238	MS
19	Co86032	18.07	33.28	7.96	27.39	3719	MS

In AVT-I Plant, cumulative shoot borer incidence ranged from 14.2% (Co 13013) to a maximum of 49.4% (CoSnk 13101). Out of 19 entries only one entry (Co 13013) was LS, eight entries were MS and the rest ten were HS. Least number of bored shoots was recorded in the entry Co 13013 (792/ha) and maximum number of bored shoots were recorded in the entry CoN 13072 (3810/ha).

Table-3: Shoot Borer Incidence in AVT- II Plant

S.No	Entry	% Incidence				No.of bored plants/ha	Infestation Index
		30 DAP	60 DAP	90 DAP	Cumulative incidence		
1	Co12007	10.31	13.16	1.08	13.13	17078	LS
2	Co12008	12.94	15.18	9.50	34.21	21399	HS
3	Co12009	16.77	36.30	4.47	25.06	20576	MS
4	Co12012	9.12	10.57	1.18	11.91	13992	LS
5	Co12019	7.24	19.37	2.03	20.89	18313	MS
6	Co12024	7.07	4.93	1.20	11.69	15638	LS
7	CoM12085	10.65	19.89	9.07	30.61	30041	HS
8	VS112121	8.74	10.52	2.59	17.69	18313	MS
9	CoC671	5.51	4.31	0.69	12.37	12551	LS
10	Co86032	11.64	4.22	2.40	13.70	17284	LS

In AVT-II, overall incidence of shoot borer was less ranging from 11.7% (Co 12024) to 34.2% (Co 12008). Out of ten entries five entries were LS, three MS and only two were HS. Number of bored plants was less in the check CoC 671 (12551/ha) and high in the entry CoM 12085 (30041/ha).

Table-4: Internode Borer Incidence in IVT

S.No	Entry	% Incidence	% Intensity	Infestation Index	Infestation Grade
1	Co14005	35.00	2.33	0.82	MS
2	Co15002	65.00	2.79	1.81	HS
3	Co15005	60.00	3.37	2.02	HS
4	Co15006	35.00	2.30	0.81	MS
5	Co 15007	30.00	1.67	0.50	MS
6	Co15009	40.00	2.11	0.84	MS
7	Co15010	45.00	2.51	1.13	HS
8	Co15015	50.00	2.38	1.19	HS
9	Co15017	0.00	0.00	0.00	LS
10	Co15018	25.00	1.42	0.36	MS
11	Co15020	45.00	3.45	1.55	HS
12	Co15021	43.33	2.03	0.88	HS
13	CoN15071	70.00	3.01	2.11	HS
14	CoN 15072	37.50	4.41	1.65	MS
15	CoSnk 15101	15.00	4.15	0.62	LS
16	CoSnk15102	43.33	2.27	0.98	HS
17	CoSnk15103	0.00	0.00	0.00	LS
18	CoVC 15061	40.00	2.22	0.89	MS
19	CoVC 15061	40.00	2.22	0.89	MS
20	CoVC15062	42.10	2.57	1.08	HS
21	CoVC15063	45.00	2.56	1.15	HS
22	CoVC15064	0.00	0.00	0.00	LS
23	PI 15131	50.00	3.74	1.87	HS
24	P115132	40.00	2.65	1.06	MS
25	VS115121	50.00	2.88	1.44	HS
26	VS115122	45.00	3.24	1.46	HS
27	Co86032	33.33	1.90	0.63	MS

Internode borer incidence, recorded at the time of harvest, in IVT ranged from nil (CoSnk 15103 &CoVC 15064) to 70% (CoN 15071) and the intensity ranged from nil to 4.4 (CoN 15072). Out of 27 entries, four entries were rated LS, 10 were MS and 13 were HS.

Table -5: Internode Borer Incidence in AVT-I Plant

S.No	Entry	% Incidence	% Intensity	Infestation Index	Infestation Grade
1	Co13002	43.33	2.70	1.17	HS
2	Co13003	20.00	1.64	0.33	LS

3	Co13004	30.00	2.06	0.62	MS
4	Co13006	16.67	0.91	0.15	LS
5	Co13008	26.67	2.39	0.64	MS
6	Co13009	16.67	0.98	0.16	LS
7	Co13013	46.67	2.98	1.39	HS
8	Co13014	30.00	1.93	0.58	MS
9	Co13018	40.00	3.07	1.23	MS
10	Co13020	27.40	1.68	0.46	MS
11	CoN13072	43.33	2.51	1.09	HS
12	CoN13073	10.00	0.59	0.06	LS
13	CoSnk13101	45.00	2.61	1.17	HS
14	CoSnk13103	20.00	1.52	0.30	LS
15	CoSnk13106	26.67	1.40	0.37	MS
16	MS13081	26.67	1.93	0.51	MS
17	P113132	46.67	2.71	1.26	HS
18	CoC671	40.00	1.80	0.72	MS
19	Co86032	20.00	1.05	0.21	LS

In AVT-I Plant overall incidence of internode borer was moderate ranging from 10% in CoN 13073 to 46.7% in CoSnk 13103. Intensity of incidence was minimum (0.59%) in the entry Co CoN 13073 and maximum (3.07%) in Co 13018. Out of 19 entries, six were rated LS, eight were MS and the rest five were HS.

Table-6: Internode borer incidence in AVT-II Plant

S.No	Entry	% incidence	% Intensity	Infestaion Index	Infestation Grade
1	Co12007	46.67	2.23	1.04	HS
2	Co12008	36.67	1.71	0.63	MS
3	Co12009	10.00	1.02	0.10	LS
4	Co12012	43.33	2.32	1.01	HS
5	Co12019	30.00	1.69	0.51	MS
6	Co12024	30.00	2.26	0.68	MS
7	CoM12085	26.67	2.31	0.62	MS
8	VS112121	16.67	1.45	0.24	LS
9	CoC671	43.33	1.70	0.74	HS
10	Co86032	16.67	1.60	0.27	LS

In AVT-II, incidence of the borer ranged from 10% (Co 12009) to 46.7% (Co 12007). Intensity of the borer was minimum (1.02) in the entry Co 12009 and maximum (2.32) in the entry Co 12012. Out of 10 entries, three were LS, four were rated MS and the rest three were HS.

Overall incidence of top borer across the entries was less than 5% and the root borer incidence was in traces.

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In IVT Early and mid late maturing group 26 genotypes with their Zonal checks (Midlate Co 86032 and early checks CoSnk 05103, CoC 671 and Co 85004) were screened for their reaction against major sugarcane pests. In this genotypes Co 15021, CoVC 15062, CoVC 15063, PI 15131and CoN 15071 coming under Midlate group registered less susceptible (LS) reaction against all the borer pests. Similarly, genotypes, Co 15010, Co 15009, CoSnk 05103 and VSI 15122 early maturity group showed less susceptible (LS) reaction against all the borer pests (Table-1).

In AVT- I Plant, Early and mid late maturing group 17 genotypes with their Zonal checks (Mid late Co 86032 and early checks CoSnk 05103 and CoC 671) were screened for their reaction against major sugarcane pests. Among the genotypes screened Co 13018, Co 13004 and Co 13020 genotypes registered less susceptible reaction against all the borer pests (Table-2).

In AVT- II Plant early and mid late maturing group 8 genotypes with their Zonal checks (Mid late Co 86032 and early checks CoSnk 05103 and CoC 671) were screened for their reaction against major sugarcane pests. Among the genotypes screened Co 12009, CoM 12085, VSI 12121 and Co 12012 exhibited less susceptible reaction against borer pests (Table-3).

Table-1: Reaction of Sugarcane genotypes under IVT trial against ESB, TSB and INB

S. No.	Clone	ESB		TSB		INB	
		(%) Incidence	Infest grade	(%) Incidence	Infestation grade	(%) Incidence	Infest Grade
1	Co 14005	8.00(16.43)	LS	7.50(15.89)	LS	26.50(30.98)	MS
2	Co 15002	9.90(18.34)	LS	6.19(14.40)	LS	22.75(28.49)	MS
3	Co 15005	6.98(15.32)	LS	3.93(11.43)	LS	22.50(28.32)	MS
4	Co 15006	7.57(15.96)	LS	5.25(13.25)	LS	23.75(29.17)	MS
5	Co 15007	11.67(19.98)	LS	7.61(16.01)	LS	22.50(28.32)	MS
6	CoSnk 15101	6.92(15.25)	LS	8.39(16.84)	LS	23.25(28.83)	MS
7	CoSnk 15102	9.83(18.27)	LS	7.48(15.87)	LS	24.25(29.50)	MS
8	CoVSI 15121	7.60(16.00)	LS	9.00(17.46)	LS	27.50(31.63)	MS
9	Co 15009	6.23(14.45)	LS	6.82(15.14)	LS	17.13(24.45)	LS
10	Co 15010	8.42(16.86)	LS	4.00(11.53)	LS	18.17(25.23)	LS
11	Co 15015	11.11(19.47)	LS	7.88(16.31)	LS	20.75(27.10)	MS
12	Co 15017	11.67(19.98)	LS	7.82(16.23)	LS	26.50(30.98)	MS
13	Co 15018	10.98(19.35)	LS	7.61(16.01)	LS	22.50(28.32)	MS
14	Co 15020	8.56(17.01)	LS	8.35(16.79)	LS	23.75(29.17)	MS
15	Co 15021	8.79(17.24)	LS	4.00(11.53)	LS	11.75(20.05)	LS
16	CoN 15071	7.16(15.51)	LS	3.75(11.17)	LS	14.50(22.38)	LS
17	CoN 15072	7.30(15.68)	LS	6.69(14.99)	LS	28.75(32.42)	MS
18	CoSnk 15103	8.03(16.46)	LS	4.82(12.68)	LS	15.09(22.85)	LS
19	CoSnk 15104	5.71(13.82)	LS	4.93(12.83)	LS	24.75(29.83)	MS
20	CoVC 15061	8.04 (16.47)	LS	9.19(17.64)	LS	22.00(27.97)	MS
21	CoVC 15062	5.46 (13.51)	LS	6.00(14.18)	LS	13.00(21.13)	LS
22	CoVC 15063	4.79(12.64)	LS	7.07(15.42)	LS	10.00(18.43)	LS
23	CoVC 15064	12.96(21.10)	LS	10.69(19.08)	MS	19.75(26.39)	LS
24	PI 15131	5.34(13.35)	LS	5.65(13.75)	LS	16.75(24.16)	LS
25	PI 15132	9.92(18.35)	LS	6.19(14.40)	LS	25.00(30.00)	MS
26	VSI 15122	8.97(17.42)	LS	4.64(12.44)	LS	11.00(19.37)	LS
Stds.							
1	Co 86032	7.77(16.19)	LS	4.00(11.53)	LS	20.25(26.74)	MS
2	CoC 671	8.80(17.26)	LS	5.00(12.92)	LS	26.00(30.66)	MS
3	CoSnk 05103	10.41(18.82)	LS	5.50(13.56)	LS	24.00(29.33)	MS
4	Co 85004	11.38(19.71)	LS	7.13(15.48)	LS	24.25(29.50)	MS
	SE (m)	1.178		0.602		2.344	
	CD @ 5%	3.41		1.74		6.78	
	CV %	19.51		13.22		15.82	

Figures in parentheses are arc sine transformed values whereas values present outside the parenthesis are original values.

Note: ESB – Early shoot borer, TSB – Top shoot borer, INB – Internode borer, LS – Less susceptible, MS – Moderately susceptible

Table-2: Reaction of Sugarcane genotypes under AVT I PC trial against ESB, TSB and INB

Sl. No.	Genotypes	ESB		TSB		INB	
		(%) Incidence	Infest grade	(%) Incidence	Infest grade	(%) Incidence	Infesti grade
1	Co 13002	13.57 (21.62)	LS	10.55 (18.95)	LS	22.25 (28.14)	MS
2	Co 13003	10.27 (18.69)	LS	8.45 (16.89)	LS	23.25 (28.83)	MS
3	Co 13004	6.98 (15.32)	LS	7.21 (15.57)	LS	16.19 (23.72)	LS
4	CoN 13072	9.91 (18.35)	LS	3.75 (11.16)	LS	24.75 (29.83)	MS
5	CoSnk 13101	9.34 (17.80)	LS	6.42 (14.68)	LS	20.50 (26.92)	MS
6	MS13081	3.41 (10.64)	LS	6.03 (14.21)	LS	23.75 (29.17)	MS
7	Co 13006	11.18 (19.53)	LS	7.38 (15.76)	LS	22.50 (28.32)	MS
8	Co 13008	7.34 (15.71)	LS	11.17 (19.52)	MS	25.50 (30.33)	MS
9	Co 13009	6.87 (15.19)	LS	10.92 (19.30)	MS	18.50 (25.47)	LS
10	Co 13013	8.53 (16.98)	LS	9.80 (18.24)	LS	22.50 (28.32)	MS
11	Co 13014	8.17 (16.60)	LS	7.13 (15.48)	LS	20.50 (26.92)	MS
12	Co 13018	3.27 (10.41)	LS	7.52 (15.91)	LS	13.75 (21.77)	LS
13	Co 13020	7.42 (15.80)	LS	8.80 (17.26)	LS	10.25 (18.67)	LS
14	CoN13073	9.74 (18.19)	LS	8.66 (17.11)	LS	25.75 (30.49)	MS
15	CoSnk 13103	10.02 (18.45)	LS	11.67 (19.98)	MS	22.75 (28.49)	MS
16	CoSnk 13106	8.60 (17.05)	LS	9.52 (17.97)	LS	24.00 (29.33)	MS
17	PI13132	9.85 (18.29)	LS	6.68 (14.97)	LS	22.50 (28.32)	MS
	Stds.						
18	Co86032	4.98 (12.89)	LS	7.30 (15.68)	LS	22.25 (28.14)	MS
19	CoC671	6.67 (14.97)	LS	8.95 (17.40)	LS	20.75 (27.10)	MS
20	CoSnk 05103	6.84 (15.16)	LS	9.84 (18.28)	LS	23.50 (29.00)	MS
	SE (m)	1.175		1.180		1.739	
	CD @ 5%	3.48		3.49		5.15	
	CV %	20.40		19.90		11.55	

Figures in parentheses are arc sine transformed values whereas values present outside the parenthesis are original values.

Note: ESB – Early shoot borer, TSB – Top shoot borer, INB – Internode borer, LS – Less susceptible, MS – Moderately susceptible.

Table-3: Reaction of Sugarcane genotypes under AVT II PC trial against ESB, TSB and INB

Sl. No.	Genotypes	ESB		TSB		INB	
		(%) Incidence	Infestation grade	(%) Incidence	Infesta-tion grade	(%) Incidence	Infesta-tion grade
1	Co 12007	9.81(18.25)	LS	11.43(19.76)	MS	21.93(27.93)	MS
2	Co 12008	11.40(19.73)	LS	12.38(20.60)	MS	23.17(28.77)	MS
3	Co 12009	8.71(17.16)	LS	9.02(17.47)	LS	16.48(23.95)	LS
4	Co 12012	6.68(14.98)	LS	7.18(15.54)	LS	15.27(23.00)	LS
5	Co 12019	10.52(18.92)	LS	10.93(19.31)	MS	22.67(28.43)	MS
6	Co 12024	9.48(17.93)	LS	8.58(17.04)	LS	20.33(26.80)	MS
7	COM12085	7.40(15.79)	LS	8.52(16.97)	LS	13.05(21.18)	LS
8	VSI12121	8.08(16.52)	LS	8.22(16.66)	LS	15.51(23.19)	LS
Stds.							
9	Co 86032	8.10(16.53)	LS	5.95(14.12)	LS	23.83(29.22)	MS
10	CoC 671	8.89(17.35)	LS	7.69(16.10)	LS	24.50(29.67)	MS
11	CoSnk 05103	9.56(18.01)	LS	9.02(17.47)	LS	23.00(28.66)	MS
	SE (m)	0.578		0.658		1.540	
	CD @ 5%	1.71		1.94		4.54	
	CV %	11.17		12.67		13.35	

Figures in parentheses are arc sine transformed values whereas values present outside the parenthesis are original values. ESB – Early shoot borer, TSB – Top shoot borer, INB – Internode borer, LS – Less susceptible, MS – Moderately susceptible

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Mealy bug

The mealy bug incidence ranged from 45.0 to cent per cent. All test genotypes recorded highly susceptible (HS) reaction to mealy bug. The entries *viz.*, Co 15005, Co 15017 and Co 15018 observed least incidence of mealy bug (45.00 %), while least per cent intensity was observed in Co 15015 (3.38 %). The cent per cent incidence was observed in CoSnk 15102, CoVSI 15121, CoVC 15061 and CoVC 15062 (Table -3).

Scale insect

In case of scale insect, the incidence ranged from 0 to 20 per cent. The 22 and 8 test genotypes showed less susceptible and moderately susceptible reaction to scale insect. The 15 entries showed no incidence to scale insect (Table -4).

Table-1. Evaluation of genotypes/varieties for their reaction against internode borer.

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 14005	0.00 (0.00)	28.57 (32.31)	25.23 (30.15)	4.44 (12.16)	30.90 (33.77)	HS	30903.79
2	Co 15002	0.00 (0.00)	29.51 (32.90)	30.67 (33.63)	7.32 (15.69)	38.21 (38.18)	HS	38211.38
3	Co 15005	0.00 (0.00)	29.73 (33.04)	21.14 (27.37)	12.00 (20.27)	40.22 (39.36)	HS	40217.39
4	Co 15006	0.00 (0.00)	40.20 (39.35)	25.83 (30.55)	6.90 (15.23)	42.55 (40.72)	HS	42553.19
5	Co 15007	0.00 (0.00)	37.82 (37.95)	32.67 (34.86)	12.22 (20.46)	52.98 (46.71)	HS	52976.19

6	CoSnK 15101	0.00 (0.00)	50.43 (45.25)	20.00 (26.57)	5.71 (13.83)	40.81 (39.70)	HS	40807.17
7	CoSnk 15102	0.00 (0.00)	31.43 (34.10)	26.51 (30.99)	8.43 (16.88)	40.16 (39.32)	HS	40157.48
8	CoVSI 15121	0.00 (0.00)	33.33 (35.26)	30.65 (33.61)	10.53 (18.93)	49.00 (44.43)	HS	49000
9	Co 15009	0.00 (0.00)	22.34 (28.21)	26.50 (30.98)	10.94 (19.31)	36.67 (37.27)	HS	36666.67
10	Co 15010	0.00 (0.00)	15.46 (23.16)	39.84 (39.14)	5.71 (13.83)	35.92 (36.82)	HS	35922.33
11	Co 15015	0.00 (0.00)	21.21 (27.42)	37.50 (37.76)	9.65 (18.10)	41.81 (40.29)	HS	41807.91
12	Co 15017	0.00 (0.00)	33.94 (35.64)	30.00 (33.21)	5.15 (13.11)	38.28 (38.22)	HS	38277.51
13	Co 15018	0.00 (0.00)	15.15 (22.91)	14.96 (22.75)	4.08 (11.66)	22.10 (28.04)	MS	22099.45
14	Co 15020	0.00 (0.00)	24.19 (29.46)	14.00 (21.97)	3.91 (11.41)	25.22 (30.14)	MS	25217.39
15	Co 15021	0.00 (0.00)	22.63 (28.40)	14.77 (22.60)	4.49 (12.23)	28.71 (32.40)	MS	28708.13
16	CoN 15071	0.00 (0.00)	36.73 (26.31)	21.28 (27.47)	4.46 (12.19)	37.76 (37.91)	HS	37759.34
17	CoN 15072	0.00 (0.00)	27.88 (31.87)	20.51 (26.93)	4.27 (11.93)	34.12 (35.74)	HS	34117.65
18	CoSnk 15103	0.00 (0.00)	30.77 (33.69)	21.32 (27.50)	7.79 (16.21)	33.95 (35.64)	HS	33953.49
19	CoSnk 15104	0.00 (0.00)	35.42 (36.52)	23.89 (29.26)	5.31 (13.32)	38.51 (38.35)	HS	38505.75
20	CoVC 15061	0.00 (0.00)	26.35 (30.89)	20.31 (26.79)	4.63 (12.43)	29.93 (33.17)	MS	29931.97
21	CoVC 15062	0.00 (0.00)	33.62 (35.44)	24.48 (29.65)	9.22 (17.68)	40.47 (39.50)	HS	40465.12
22	CoVC 15063	0.00 (0.00)	30.95 (33.80)	30.59 (33.58)	11.05 (19.41)	41.83 (40.30)	HS	41825.1
23	CoVC 15064	0.00 (0.00)	26.60 (31.04)	30.33 (33.42)	14.88 (22.69)	43.72 (41.39)	HS	43715.85
24	PI 15131	0.00 (0.00)	18.95 (25.81)	25.15 (30.10)	9.84 (18.28)	34.78 (36.14)	HS	34782.61
25	PI 15132	0.00 (0.00)	25.00 (30.00)	15.54 (23.22)	2.19 (8.50)	23.50 (29.00)	MS	23504.27
26	VSI 15122	0.00 (0.00)	28.13 (32.03)	15.04 (22.82)	9.24 (17.70)	33.74 (35.51)	HS	33742.33
27	Co 86032	1.15 (6.15)	44.12 (41.62)	22.00 (27.97)	14.58 (22.45)	50.00 (45.00)	HS	50000
28	CoC 671	0.00 (0.00)	20.2 (26.73)	25.7 (30.49)	5.10 (13.05)	34.51 (35.97)	HS	34507.04
29	CoSnk 05103	0.00 (0.00)	11.8 (20.11)	11.8 (20.09)	6.81 (15.14)	21.15 (27.38)	MS	21153.85
30	Co 85004	0.00 (0.00)	10.1 (18.50)	26 (30.68)	18.92 (25.78)	39.09 (38.70)	HS	39086.29
S. E. ±		0.79	6.66	4.50	10.71	--	--	--
C.D. at 5 %		2.29	19.25	13.01	32.88	--	--	--
Less Susceptible **(LS)**							0-15	
Moderate Susceptible **(MS)**							15.1-30	
High Susceptible **(HS)**							Above 30	

Internode borer

Incidence of internode borer, ranged from 25 to 80 per cent. Co 15006 and VSI 15122 genotypes recorded moderately susceptible (MS) and highly susceptible (HS) reaction to internode borer respectively. The entry CoVC 15063 recorded lowest incidence to followed by CoVC 15062 and CoSnK 15101 which observed 1.73, 2.54 and 3.01 per cent intensity, respectively (Table -2).

Table-2. Evaluation of genotypes/varieties for their reaction against internode borer.

Sr. No.	Genotype	Internode borer			
		% incidence	% intensity	% Infestation index	Reaction
1	Co 14005	55.00 (47.87)	6.29	3.46	HS
2	Co 15002	80.00 (63.43)	6.97	5.57	HS
3	Co 15005	65.00 (53.73)	5.21	3.39	HS
4	Co 15006	75.00 (60.00)	7.88	5.91	HS
5	Co 15007	50.00 (45.00)	5.38	2.69	HS
6	CoSnK 15101	40.00 (39.23)	3.01	1.20	MS
7	CoSnk 15102	40.00 (39.23)	2.47	0.98	MS
8	CoVSI 15121	45.00 (42.13)	3.45	1.55	HS
9	Co 15009	45.00 (42.13)	4.37	1.97	HS
10	Co 15010	70.00 (56.79)	5.95	4.16	HS
11	Co 15015	60.00 (50.77)	6.64	3.98	HS
12	Co 15017	70.00 (56.79)	7.41	5.18	HS
13	Co 15018	70.00 (56.79)	7.44	5.20	HS
14	Co 15020	60.00 (50.77)	4.53	2.71	HS
15	Co 15021	60.00 (50.77)	3.99	2.39	HS
16	CoN 15071	50.00 (45.00)	5.07	2.53	HS
17	CoN 15072	45.00 (42.13)	5.29	2.38	HS
18	CoSnk 15103	55.00 (47.87)	7.35	4.04	HS
19	CoSnk 15104	60.00 (50.77)	5.27	3.16	HS
20	CoVC 15061	50.00 (45.00)	3.44	1.72	HS
21	CoVC 15062	30.00 (33.21)	2.54	0.76	MS
22	CoVC 15063	25.00 (30.00)	1.73	0.43	MS
23	CoVC 15064	40.00 (39.23)	3.15	1.26	MS
24	PI 15131	60.00 (50.77)	5.51	3.30	HS
25	PI 15132	55.00(47.87)	4.92	2.70	HS
26	VSI 15122	60.00(50.77)	6.35	3.81	HS
27	Co 86032	70.00 (56.79)	5.71	3.99	HS
28	CoC 671	55.00 (47.87)	6.18	3.39	HS
29	CoSnk 05103	70.00 (56.79)	4.38	3.06	HS
30	Co 85004	50.00 (45.00)	3.82	1.91	HS
	S. E. ±	9.62			
	C.D. at 5 %	27.83			
	Less Susceptible **(LS)**	0 – 20			
	Moderate Susceptible **(MS)**	20.1 – 40			
	High Susceptible **(HS)**	Above 40			

Table-3. Evaluation of genotypes/varieties for their reaction against mealybug.

Sr. No	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
1	Co 14005	85.00 (64.50)	12.31	HS
2	Co 15002	90.00 (71.56)	11.46	HS
3	Co 15005	45.00 (42.11)	5.46	HS
4	Co 15006	50.00 (45.00)	5.17	HS
5	Co 15007	60.00 (50.79)	8.21	HS
6	CoSnK 15101	95.00 (80.78)	13.18	HS

7	CoSnk 15102	100.00 (90.00)	15.29	HS
8	CoVSI 15121	100.00 (90.00)	40.36	HS
9	Co 15009	90.00 (80.78)	22.22	HS
10	Co 15010	70.00 (57.10)	8.84	HS
11	Co 15015	45.00 (42.11)	3.38	HS
12	Co 15017	45.00 (41.99)	4.07	HS
13	Co 15018	45.00 (41.67)	4.06	HS
14	Co 15020	65.00 (61.60)	7.73	HS
15	Co 15021	55.00 (49.06)	7.26	HS
16	CoN 15071	75.00 (61.16)	12.40	HS
17	CoN 15072	60.00 (51.33)	8.36	HS
18	CoSnk 15103	60.00 (51.33)	6.48	HS
19	CoSnk 15104	75.00 (60.11)	8.19	HS
20	CoVC 15061	100.00 (90.00)	26.41	HS
21	CoVC 15062	100.00 (90.00)	26.34	HS
22	CoVC 15063	95.00 (80.78)	16.80	HS
23	CoVC 15064	75.00 (60.11)	9.20	HS
24	PI 15131	65.00 (54.22)	8.29	HS
25	PI 15132	75.00 (61.16)	13.12	HS
26	VSI 15122	80.00 (70.38)	10.49	HS
27	Co 86032	60.00 (58.28)	9.59	HS
28	CoC 671	60.00 (52.38)	8.45	HS
29	CoSnk 05103	90.00 (71.56)	13.72	HS
30	Co 85004	75.00 (67.50)	11.30	HS
	S. E. ±	50.77		
	C.D. at 5 %	71.57		
	Less Susceptible **(LS)**	0 – 5		
	Moderate Susceptible **(MS)**	5.1 – 30		
	High Susceptible **(HS)**	Above 30		

Table-4. Evaluation of genotypes / varieties for their reaction against scale insect.

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
1	Co 14005	0.00 (0.00)	0.00	LS
2	Co 15002	20.00 (79.61)	2.48	MS
3	Co 15005	0.00 (0.00)	0.00	LS
4	Co 15006	0.00 (0.00)	0.00	LS
5	Co 15007	0.00 (0.00)	0.00	LS
6	CoSnK 15101	0.00 (0.00)	0.00	LS
7	CoSnk 15102	10.00 (13.28)	1.59	LS
8	CoVSI 15121	0.00 (0.00)	0.00	LS
9	Co 15009	0.00 (0.00)	0.00	LS
10	Co 15010	5.22 (9.22)	0.56	LS
11	Co 15015	10.00 (13.28)	0.70	LS
12	Co 15017	15.00 (16.60)	1.63	MS
13	Co 15018	15.00 (16.60)	2.38	MS
14	Co 15020	0.00 (0.00)	0.00	LS
15	Co 15021	15.00 (16.60)	1.66	MS
16	CoN 15071	20.00 (19.61)	2.28	MS
17	CoN 15072	10.00 (13.28)	1.48	LS
18	CoSnk 15103	0.00 (0.00)	0.00	LS
19	CoSnk 15104	10.00 (13.28)	1.07	LS
20	CoVC 15061	10.00 (13.28)	1.70	LS
21	CoVC 15062	20.00 (19.61)	2.20	MS
22	CoVC 15063	10.00 (13.28)	1.32	LS
23	CoVC 15064	0.00 (0.0 0)	0.00	LS

24	PI 15131	0.00 (0.00)	0.00	LS
25	PI 15132	0.00 (0.00)	0.00	LS
26	VSI 15122	20.00 (19.61)	2.48	MS
27	Co 86032	15.00 (16.60)	1.86	MS
28	CoC 671	0.00 (0.00)	0.00	LS
29	CoSnk 05103	0.00 (0.00)	0.00	LS
30	Co 85004	0.00 (0.00)	0.00	LS
	S. E. ±	10.11	--	--
	C.D. at 5 %	29.23	--	--
	Less Susceptible **(LS)**	0 – 10		
	Moderate Susceptible **(MS)**	10.1 – 35		
	High Susceptible **(HS)**	Above 35		

In IVT, the cumulative per cent infestation of early shoot borer ranged from 21.15 to 52.98 per cent .The CoSnk 015103 recorded least incidence of early shoot borer (21.15%) followed by Co 15018(22.10%), none of the entry showed less susceptible and moderate susceptible reaction to mealy bug, where as 4 entries showed moderately susceptible reaction to internode borer and 26 entries highly susceptible. The entries 6 and 24 observed moderately and highly susceptible reaction to early shoot borer. Regarding internode borer, the incidence ranged from 28 to 80 percent. The entry CoVC 15063 recorded lowest incidence to internode borer and followed by CoVC 15062 and CoSnk 15101 which observed 1.73,2.54 and 3.01 percent intensity, respectively. The mealy bug incidence ranged from 45.00 to cent percent. In case of scale insect, the incidence ranged from 0 to 20 percent.

Early shoot borer

The cumulative per cent infestation of early shoot borer ranged from 14.61 to 58.06 per cent. In all test genotypes, 1, 1 & 18 test genotypes showed less susceptible, moderately susceptible & highly susceptible reaction to early shoot borer, respectively. The entry CoSnk 05103 showed least infestation (14.61%) followed by Co 13018 (26.53 %) and CoSnk 13106 (28.48%) (Table-5)

Internode borer

Regarding internode borer, the incidence ranged from 43.33 to 80.00 per cent. The variety, Co 13002 and Co 86032 showed least incidence of internode borer (43.33% each) followed by, the entry Co 13008 and CoN 13073 (46.67% each). All the test genotypes showed highly susceptible reaction to internode borer, respectively. (Table-6)

Mealybug

The mealybug incidence ranged from 23.33 to 63.33 per cent. In all test genotypes, 5 & 15 test genotypes showed moderately susceptible & highly susceptible reaction to mealybug, respectively The variety CoN 13072 recorded least incidence of mealybug (23.33%), followed by Co 13020 and Co 13014 (26.67 per cent each. (Table-7)

Scale insect

Table -5. Evaluation of genotypes/ varieties for their reaction against early shoot borer.

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 13002	0.00(0.00)	35.80 (36.75)	20.18 (26.69)	12.11 (20.36)	40.06 (39.27)	HS	40061.16
2	Co 13003	0.00(0.00)	36.73 (37.31)	33.14 (35.15)	9.44 (17.90)	43.99 (41.55)	HS	43986.25
3	Co 13004	0.00(0.00)	29.73 (3.04)	32.35 (34.67)	12.37 (20.59)	51.15 (45.66)	HS	51149.43
4	CoN 13072	0.00(0.00)	37.81 (37.95)	40.74 (39.66)	18.58 (25.53)	54.15 (47.38)	HS	54153.85

5	CoSnk 13101	0.00(0.00)	55.17 (47.97)	39.07 (38.69)	16.13 (23.68)	58.06 (49.64)	HS	58064.52
6	MS 13081	0.00(0.00)	44.07 (41.59)	34.13 (35.75)	6.36 (14.61)	49.76 (44.86)	HS	49756.1
7	Co 13006	0.00(0.00)	24.81 (29.87)	24.49 (29.66)	13.64 (21.67)	40.09 (39.28)	HS	40090.09
8	Co 13008	0.00(0.00)	42.67 (40.78)	21.26 (27.46)	8.08 (16.52)	52.11 (46.21)	HS	52105.26
9	Co 13009	0.00(0.00)	36.36 (37.09)	22.02 (27.99)	15.09 (22.86)	46.43 (42.95)	HS	46428.57
10	Co 13013	0.67(4.70)	30.60 (33.59)	21.29 (27.48)	6.15 (14.36)	32.22 (34.59)	HS	32222.22
11	Co 13014	0.00(0.00)	23.57 (29.04)	23.16 (28.77)	13.15 (21.26)	37.07 (37.51)	HS	37074.83
12	Co 13018	0.96(5.63)	19.72 (26.36)	17.84 (24.98)	4.85 (12.72)	26.53 (31.00)	HS	26530.61
13	Co 13020	0.00(0.00)	34.74 (36.11)	18.68 (25.61)	6.45 (14.71)	39.16 (38.74)	HS	39160.84
14	CoN 13073	0.00(0.00)	38.19 (38.17)	29.26 (32.74)	8.64 (17.10)	45.59 (42.47)	HS	45588.24
15	CoSnk 13103	0.00(0.00)	33.93 (35.63)	22.57 (28.36)	8.12 (16.56)	37.13 (37.54)	HS	37134.5
16	CoSnk 13106	0.00(0.00)	28.66 (32.37)	16.75 (24.16)	5.33 (13.35)	28.48 (32.26)	MS	28482.97
17	PI 13132	0.00(0.00)	39.44 (38.90)	32.48 (34.75)	9.09 (17.55)	49.79 (44.88)	HS	49790.79
18	Co 86032	0.00(0.00)	23.89 (29.26)	28.87 (32.50)	7.78 (16.20)	35.77 (36.73)	HS	35772.36
19	CoC 671	0.00(0.00)	30.30 (33.40)	21.02 (27.29)	6.40 (14.65)	35.34 (36.48)	HS	35341.37
20	CoSnk 05103	0.00(0.00)	14.46 (22.3.5)	6.39 (14.64)	4.78 (12.62)	14.61 (22.47)	LS	14609.57
S. E. ±		1.10	16.26	13.97	8.12	--	--	--
C.D. at 5 %		3.15	46.55	40.00	23.24	--	--	--
Less Susceptible **(LS)**							0 – 15	
Moderate Susceptible **(MS)**							15.1 – 30	
High Susceptible **(HS)**							Above 30	

Table-6. Evaluation of genotypes/varieties for their reaction against internode borer.

Sr. No.	Genotype	Internode borer			
		% incidence	**% intensity**	**% Infestation index**	**Reaction**
1	Co 13002	43.33 (40.86)	4.05	1.75	HS
2	Co 13003	63.33 (52.86)	6.29	3.98	HS
3	Co 13004	60.00 (50.85)	4.59	2.75	HS
4	CoN 13072	60.00 (51.15)	5.56	3.33	HS
5	CoSnk 13101	53.33 (48.00)	5.12	2.73	HS
6	MS 13081	56.67 (48.93)	5.21	2.95	HS
7	Co 13006	50.00 (45.00)	3.75	1.87	HS
8	Co 13008	46.67 (42.70)	3.56	1.66	HS
9	Co 13009	83.33 (66.64)	8.67	7.22	HS
10	Co 13013	66.67 (60.00)	6.02	4.01	HS
11	Co 13014	50.00 (45.00)	4.47	2.23	HS
12	Co 13018	46.67 (43.08)	3.78	1.76	HS
13	Co 13020	66.67 (55.86)	6.21	4.14	HS
14	CoN 13073	46.67 (43.08)	4.78	2.23	HS

15	CoSnk 13103	80.00 (67.86)	10.62	8.49	HS
16	CoSnk 13106	63.33 (53.85)	5.89	3.73	HS
17	PI 13132	53.33 (46.92)	4.27	2.28	HS
18	Co 86032	43.33 (41.07)	3.93	1.70	HS
19	CoC 671	53.33 (46.90)	4.43	2.36	HS
20	CoSnk 05103	50.00 (45.08)	4.77	2.38	HS
	S. E. ±	25.55	--	--	--
	C.D. at 5 %	73.13	--	--	--
	Less Susceptible **(LS)**	0 – 20			
	Moderate Susceptible **(MS)**	20.1 – 40			
	High Susceptible **(HS)**	Above 40			

Table-7. Evaluation of genotypes/varieties for their reaction against mealy bug.

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
1	Co 13002	60.00 (56.15)	15.23	HS
2	Co 13003	60.00 (56.07)	6.57	HS
3	Co 13004	50.00 (45.00)	4.18	HS
4	CoN 13072	23.33 (28.08)	2.38	MS
5	CoSnk 13101	63.33 (53.15	10.95	HS
6	MS 13081	33.33 (35.22)	2.76	HS
7	Co 13006	60.00 (51.15)	6.73	HS
8	Co 13008	56.67 (54.15)	6.16	HS
9	Co 13009	26.67 (30.29)	2.61	MS
10	Co 13013	40.00 (38.85)	4.72	HS
11	Co 13014	26.67 (30.29)	2.23	MS
12	Co 13018	36.67 (36.93)	2.82	HS
13	Co 13020	26.67 (30.78)	3.08	MS
14	CoN 13073	36.67 (36.84)	4.73	HS
15	CoSnk 13103	33.33 (34.22)	2.28	HS
16	CoSnk 13106	50.00 (49.92)	8.68	HS
17	PI 13132	36.67 (36.93)	4.36	HS
18	Co 86032	43.33 (40.78)	4.57	HS
19	CoC 671	30.00 (33.21)	2.56	MS
20	CoSnk 05103	56.67 (49.92)	7.47	HS
	S. E. ±	21.39	--	--
	C.D. at 5 %	61.24	--	--
	Less Susceptible **(LS)**	0 – 5		
	Moderate Susceptible **(MS)**	5.1 – 30		
	High Susceptible **(HS)**	Above 30		

In case of scale insect, the incidence ranged from 0 to 13.33 per cent. None of the entry showed highly susceptible reaction to scale insect. The 1 and 19 test genotypes showed less susceptible and moderately susceptible reaction to scale insect, respectively. The 15 entries showed no incidence to scale insect. (Table-8).

Table-8. Evaluation of genotypes/varieties for their reaction against scale insect.

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
1	Co 13002	0.00 (0.00)	0.00	LS

2	Co 13003	0.00 (0.00)	0.00	LS
3	Co 13004	0.00 (0.00)	0.00	LS
4	CoN 13072	0.00 (0.00)	0.00	LS
5	CoSnk 13101	3.33 (6.15)	0.45	LS
6	MS 13081	0.00 (0.00)	0.00	LS
7	Co 13006	0.00 (0.00)	0.00	LS
8	Co 13008	0.00 (0.00)	0.00	LS
9	Co 13009	0.00 (0.00)	0.00	LS
10	Co 13013	0.00 (0.00)	0.00	LS
11	Co 13014	3.33 (6.15)	0.21	LS
12	Co 13018	0.00 (0.00)	0.00	LS
13	Co 13020	0.00 (0.00)	0.00	LS
14	CoN 13073	3.33 (6.15)	0.46	LS
15	CoSnk 13103	3.33 (6.15)	0.38	LS
16	CoSnk 13106	13.33 (17.71)	1.21	MS
17	PI 13132	0.00 (0.00)	0.00	LS
18	Co 86032	0.00 (0.00)	0.00	LS
19	CoC 671	0.00 (0.00)	0.00	LS
20	CoSnk 05103	0.00 (0.00)	0.00	LS
	S. E. ±	4.47	--	--
	C.D. at 5 %	12.79	--	--
	Less Susceptible **(LS)**	0 – 10		
	Moderate Susceptible **(MS)**	10.1 – 35		
	High Susceptible **(HS)**	Above 35		

In AVT I plant trial, the cumulative per cent of early shoot borer ranged from 14.61 to 58.06 percent. The entry CoSnK 05103 showed least infestation (14.61%) followed by Co 13018(26.53%) and CoSnK 13106 (28.48%). Regarding internode borer, the incidence ranged from 43.33 to 80.00 per cent . The variety, Co 13002 and Co 86032 showed least incidence of internode borer (43.33% each) followed by, the entry Co 13008 and CoN 13073 (46.67%ech). The mealybug incidence ranged 23.33 to 63.33 per cent. In case of scale insect, the incidence ranged from 0 to 13.33 per cent. All test genotypes showed highly susceptible (HS) reaction to internode borer.

Ratoon :

Pests incidence data presented in table 9 to 12 and it has been observed that the differences in pest incidence due to various genotypes in relation to cumulative per cent infestation of early shoot borer, internode borer, and mealy bug was statistically significant.

Early shoot borer

The cumulative per cent infestation of early shoot borer ranged from 24.53 to 53.37 per cent. In AVT II Plant, no entry observed less susceptible reaction to early shoot borer. Co 12009 & VSI 12121 test genotypes showed moderately susceptible (MS) and highly susceptible reaction (HS) to early shoot borer, respectively. The entry Co 12008 recorded moderate incidence to early shoot borer (24.53%), followed by CoSnk 05103 (25.64%) (Table-9).

Internode borer

Regarding internode borer, the incidence ranged from 30.00 to 63.33 per cent. In AVT II Plant, the Co 1200 7and CoC 671 test genotypes showed moderately susceptible (MS) and highly susceptible (HS) reaction to internode borer, respectively. The only entry Co 86032 recorded moderate incidence to internode borer (30%)(Table-10).

Mealy bug

The mealy bug incidence ranged from 23.33 to 83.33 per cent. The Co 1200 7and CoC 671 test genotypes showed moderately and highly susceptible (HS) reaction to mealy bug The only entry VSI 12121 recorded moderate incidence to mealy bug (23.33%) (Table-11).

Table-9: Evaluation of genotypes/varieties for their reaction against early shoot borer in ratoons crop.

Sr. No	Genotype	Per cent incidence of ESB						No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence	Reaction	
1	Co 12007	0.00 (0.00)	18.86 (25.74)	17.18 (24.48)	6.08 (14.28)	27.57 (31.67)	MS	27565.98
2	Co 12008	0.78 (5.07)	14.86 (22.68)	14.36 (22.27)	6.54 (14.82)	24.53 (29.69)	MS	24528.3
3	Co 12009	0.00 (0.00)	26.21 (30.79)	23.46 (28.97)	7.36 (15.74)	36.82 (37.36)	HS	36820.08
4	Co 12012	0.76 (4.99)	29.89 (33.14)	26.27 (30.83)	6.87 (15.20)	35.79 (36.74)	HS	35789.47
5	Co 12019	0.00 (0.00)	35.93 (36.83)	27.23 (31.45)	6.15 (14.36)	40.97 (39.80)	HS	40967.74
6	Co 12024	0.00 (0.00)	45.73 (42.55)	28.42 (32.21)	9.04 (17.50)	45.71 (42.54)	HS	45714.29
7	CoM 12085	0.00 (0.00)	42.98 (40.96)	27.78 (31.81)	13.54 (21.59)	53.37 (46.93)	HS	53370.79
8	VSI 12121	0.00 (0.00)	35.66 (36.67)	27.38(31.55)	7.56 (15.96)	40.89 (39.75)	HS	40892.19
9	Co 86032	0.00 (0.00)	36.97 (37.45)	30.92 (33.78)	5.68 (13.78)	38.98 (38.64)	HS	38983.05
10	CoC 671	0.00 (0.00)	38.52 (38.36)	19.44 (26.17)	6.59 (14.87)	38.58 (38.40)	HS	38582.68
11	CoSnk 05103	0.00 (0.00)	22.08 (28.03)	13.72 (21.74)	6.07 (14.27)	25.64 (30.42)	MS	25641.03
S. E. ±		1.16	5.17	2.69	2.32			--
C.D. at 5 %		3.42	15.26	7.94	6.85			--
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							> 30	

Scale Insect:

In case of scale insect, the incidence ranged from 0 to 26.67 per cent. None of the entry showed highly susceptible reaction to scale insect. The Co 86032 and Co 12008 test genotypes showed less susceptible and moderately susceptible reaction to scale insect, respectively. The 9 entries showed no incidence to scale insect. (Table-12).

In AVT II trial, the cumulative per cent infestation of early shoot borer ranged from 24.53 to 53.37 percent. The entry Co 12008 recorded moderate incidence to early shoot borer (24.53%),followed by CoSnk 05103(25.64%).Regarding internode borer, the incidence ranged from 30.00 to 63.33 percent. The only entry Co86032 recorded moderate incidence to internode borer (30%). The mealy bug incidence ranged from 23.33 to 83.33 per cent. All the entries showed highly susceptible reaction to mealybug except genotypes VSI 12121 which recorded moderate incidence (23.33%). In case of scale insect, the incidence ranged from 0 to 26.67 percent and the 9 entries showed no incidence to scale insect.

Ratoon :

Early ratoon shoot borer :

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 30, 60, 90 and 120 days after ratooning date and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

Internode borer, scale insect and mealy bugs :

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

The data is presented in table 13 to 16. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

Early shoot borer

The cumulative per cent infestation of early shoot borer ranged from 8.53 to 18.75 per cent. In AVT ratoon trial, 9 and 3 test genotypes showed less susceptible and moderately susceptible reaction to early shoot borer, respectively. None of the entry showed highly susceptible reaction to early shoot borer. The entry CoSnk 05103 observed least infestation to early shoot borer (8.53%), followed by Co 86032 (9.15%). (Table-13).

Table-10: Evaluation of genotypes/varieties for their reaction against internode borer in ratoon crop.

Sr. No.	Genotype	Internode borer			
		% incidence	% intensity	% Infestation index	Reaction
01	Co 12007	46.67 (43.08)	4.49	2.09	HS
02	Co 12008	60.00 (56.07)	5.26	3.16	HS
03	Co 12009	50.00 (44.92)	3.70	1.85	HS
04	Co 12012	63.33 (52.78)	4.55	2.88	HS
05	Co 12019	56.67 (48.85)	5.08	2.88	HS
06	Co 12024	50.00 (44.71)	3.89	1.94	HS
07	CoM 12085	33.33 (30.00)	4.63	1.54	HS
08	VSI 12121	56.67 (48.93)	4.96	2.81	HS
09	Co 86032	30.00 (31.92)	2.85	0.85	MS
10	CoC 671	53.33 (41.01)	4.46	2.38	HS
11	CoSnk 05103	56.67 (49.14)	4.31	2.44	HS
	S. E. ±	29.38	--	--	--
	C.D. at 5 %	38.15	--	--	--

	Less Susceptible **(LS)**	0 – 20	
	Moderate Susceptible **(MS)**	20.1 – 40	
	High Susceptible **(HS)**	Above 40	

Table-11. Evaluation of genotypes/varieties for their reaction against mealybug in ratoon crop

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 12007	70.00(58.08)	9.79	HS
02	Co 12008	86.67(72.78)	16.23	HS
03	Co 12009	83.33(70.08)	17.03	HS
04	Co 12012	56.67(48.85)	7.27	HS
05	Co 12019	56.67(48.93)	8.67	HS
06	Co 12024	63.33(53.07)	8.94	HS
07	CoM 12085	33.33(34.92)	3.35	HS
08	VSI 12121	23.33(28.29)	2.29	MS
09	Co 86032	50.00(45.00)	5.05	HS
10	CoC 671	50.00(45.00)	4.63	HS
11	CoSnk 05103	43.33(41.15)	3.90	HS
	S. E. ±	6.48	--	--
	C.D. at 5 %	19.13	--	--
	Less Susceptible **(LS)**	0 – 5		
	Moderate Susceptible **(MS)**	5.1 – 30		
	High Susceptible **(HS)**	Above 30		

Table-12. Evaluation of genotypes/varieties for their reaction against scale insect in ratoon crop

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 12007	0.00 (0.00)	0.00	LS
02	Co 12008	0.00 (0.00)	0.00	LS
03	Co 12009	26.67 (25.08)	2.78	MS
04	Co 12012	0.00 (0.00)	0.00	LS
05	Co 12019	0.00 (0.00)	0.00	LS
06	Co 12024	0.00 (0.00)	0.00	LS
07	CoM 12085	0.00 (0.00)	0.00	LS
08	VSI 12121	0.00 (0.00)	0.00	LS
09	Co 86032	0.00 (0.00)	0.00	LS
10	CoC 671	16.67 (15.00)	2.00	MS
11	CoSnk 05103	0.00 (0.00)	0.00	LS
	S. E. ±	7.02	--	--
	C.D. at 5 %	20.71	--	--
	Less Susceptible **(LS)**	0 – 10		
	Moderate Susceptible **(MS)**	10.1 – 35		
	High Susceptible **(HS)**	Above 35		

Table-13. Evaluation of genotypes/varieties against early shoot borer in ratoon crop

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 12007	0.00 (0.00)	5.18 (13.16)	7.95 (16.38)	10.21 (18.63)	17.48 (24.72)	MS	17484.01
2	Co 12008	0.53 (4.18)	4.10 (11.69)	5.15 13.12 ()	8.17 (16.61)	14.17 (22.11)	LS	14166.67
3	Co 12009	1.20 (6.30)	8.18 (16.61)	4.53 (12.29)	7.10 (15.46)	13.49 (21.55)	LS	13492.06
4	Co 12012	1.46 (6.95)	5.19 (13.17)	5.32 (13.33)	6.61 (14.89)	13.49 (21.55)	LS	13490.96
5	Co 12019	0.64 (4.58)	7.44 (15.83)	7.03 (15.38)	10.56 (18.96)	18.75 (25.66)	MS	18750
6	Co 12024	0.00 (0.00)	6.27 (14.50)	6.37 (14.61)	8.78 (17.24)	15.76 (23.39)	MS	15756.63
7	CoM 12085	0.00 (0.00)	4.35 (12.04)	6.69 (14.99)	9.09 (17.55)	14.85 (22.66)	LS	14847.16
8	VSI 12121	1.10 (6.03)	4.14 (11.75)	4.20 (11.83)	6.07 (14.27)	11.58 (19.90)	LS	11583.58
09	Co 86032	0.00 (0.00)	4.01 (11.56)	3.11 (10.16)	4.97 (12.88)	9.15 (17.61)	LS	9154.93
10	CoC 671	1.01 (5.77)	6.36 (14.61)	3.34 (10.53)	6.05 (14.24)	11.22 (19.57)	LS	11224.49
11	CoSnk 05103	0.45 (3.85)	3.62 (10.97)	2.64 (9.34)	4.38 (12.09)	8.53 (16.98)	LS	8525.034
S. E. ±		1.9	2.35	2.11	2.10	--	--	--
C.D. at 5 %		5.6	6.94	6.23	6.20	--	--	--
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

Internode borer

Regarding internode borer, the incidence ranged from 13.33 to 53.33 per cent. The 1, 9 and 1 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to internode borer, respectively. The variety Co 12012 recorded least incidence to internode borer (13.33%), followed by the entry Co 12008 and Co 12024 (23.33% each). (Table-14).

Table-14: Evaluation of genotypes/varieties against internode borer in ratoon crop.

Sr. No.	Genotype	Internode borer			
		% incidence	% intensity	% Infestation index	Reaction
01	Co 12007	53.33(46.92)	4.15	2.21	HS
02	Co 12008	23.33(24.15)	6.41	1.49	MS
03	Co 12009	33.33(33.93)	2.22	0.74	MS
04	Co 12012	13.33(21.15)	0.66	0.09	LS
05	Co 12019	33.33(35.01)	1.80	0.36	MS
06	Co 12024	23.33(24.15)	1.67	0.39	MS
07	CoM 12085	33.33(30.00)	1.78	2.38	MS
08	VSI 12121	33.33(34.22)	2.12	0.71	MS
09	Co 86032	30.00(33.21)	1.83	0.54	MS
10	CoC 671	30.00(33.21)	1.91	0.57	MS

11	CoSnk 05103	36.67(37.22)	2.67	0.90	MS
	S. E. ±	8.72	--	--	--
	C.D. at 5 %	25.71	--	--	--
	Less Susceptible **(LS)**	0 – 20			
	Moderate Susceptible **(MS)**	20.1 – 40			
	High Susceptible **(HS)**	Above 40			

Mealy bug

The mealybug incidence ranged from 70 to cent per cent. The all test genotypes showed highly susceptible reaction to mealybug. The entry CoC 671 (70%) followed by variety VSI 12121 (80.00%) showed least incidence to mealybug. The entry Co 12007 recorded cent per cent incidence to pest. (Table-15).

Table-15. Evaluate ion of genotypes/varieties against mealybug in ratoon crop

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 12007	100.00 (90.00)	23.32	HS
02	Co 12008	93.33 (77.71)	14.50	HS
03	Co 12009	100.00 (90.00)	18.08	HS
04	Co 12012	90.00 (75.00)	12.53	HS
05	Co 12019	93.33(77.71)	13.60	HS
06	Co 12024	93.33(77.71)	14.41	HS
07	CoM 12085	86.67(72.78)	12.93	HS
08	VSI 12121	80.00(63.93)	09.64	HS
09	Co 86032	83.33(64.15)	10.35	HS
10	CoC 671	70.00(58.08)	09.03	HS
11	CoSnk 05103	83.33(70.08)	9.97	HS
	S. E. ±	6.32	--	--
	C.D. at 5 %	18.64	--	--
	Less Susceptible **(LS)**	0 – 5		
	Moderate Susceptible **(MS)**	5.1 – 30		
	High Susceptible **(HS)**	Above 30		

Table-16: Evaluation of genotypes/varieties against scale insect in ratoon crop

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 12007	76.67 (61.71)	18.02	HS
02	Co 12008	83.33 (66.15)	16.75	HS
03	Co 12009	56.67 (49.15)	8.88	HS
04	Co 12012	83.33 (70.08)	18.63	HS
05	Co 12019	63.33 (52.86)	9.42	HS
06	Co 12024	83.33 (66.15)	14.06	HS
07	CoM 12085	80.00 (64.63)	12.97	HS
08	VSI 12121	63.33 (52.78)	9.09	HS
09	Co 86032	73.33 (59.70)	10.15	HS
10	CoC 671	86.67 (72.78)	23.17	HS
11	CoSnk 05103	90.00 (75.00)	15.82	HS
	S. E. ±	5.88	--	--
	C.D. at 5 %	17.35	--	--
	Less Susceptible **(LS)**	0 – 10		
	Moderate Susceptible **(MS)**	10.1 – 35		
	High Susceptible **(HS)**	Above 35		

Scale insect

In case of scale insect, the incidence ranged from 56.67 to 90.00 per cent. The all the test genotypes showed highly susceptible reaction to scale insect. The entries *viz.*, Co 12009 recorded least incidence to scale insect (56.67 %) (Table-16).

In AVT ratoon, trial the cumulative per cent infestation of early shoot borer ranged from 8.53 to 18.75 per cent. None of the entry showed highly susceptible reaction to early shoot borer. The entry CoSnk 05103 observed least infestation to early shoot borer (8.53%), followed by Co 86032(9.15%). Regarding internode borer, the incidence ranged from 13.33to 53.33 per cent. The variety Co 12012 recorded least incidence to internode borer (13.33%), followed by the entry Co12008 and Co 12024(23.33% each). In case of mealy bug incidence ranged from 70 to cent percent. The all test genotypes showed highly susceptible reaction to mealy bug. In scale insect, the incidence ranged from 56.67 to 90.00 percent. The all the test genotypes showed highly susceptible reaction to scale insect. The entries viz., Co 12009 recorded least incidence to scale insect (56.67%).

Vasantdada Sugar Institute, Pune

The cumulative per cent incidence of early shoot borer was above 15 % in CoC 671 (15.87%), Co 15009 (16.67), CoVc 15064 (16.67%), Co 15021 (17.89%), Co 86032 (18.58%), Co 15002 (19.64),Co 15017 (19.64), CoSnk 15103 (20.24) Co 14005 (20.61), CoSnk 15104 (21.05), Co 15006 (23.71) CoVSI 15121 (20.41) and Co 15010 (26.74%) while in other varieties/genotypes it was >15 %. No of bored plants /ha was maximum 37500 in Co14005, while it was minimum 11111 in Co 15015 and CoVc 15063. The per cent incidence of internode borer was maximum 22 % in Co15005, Co 15017 and CoSnk 15103, while CoSnk 15102, Co 15009, Co 15010, CoN 15072, CoSnk05103 and Co 85004 were free from it. The per cent intensity of internode borer was maximum 1.90 % in CoSnk 15103. While, CoSnk 15102, Co 15009, Co 15010, CoN 15072, CoSnk 05103 and Co 85004 were free from it. The infestation index of internode borer was >1.0 % in all varieties/genotypes.

Out of 30 varieties/genotypes screened CoC 671, Co 15009, CoVc 15064, Co 15021, Co 86032, Co 15002, Co 15017 ,CoSnk 15103 Co 14005, CoSnk 15104, Co 15006 CoVSI 15121 and Co 15010 showed moderately susceptible (MS) reaction to early shoot borer, Co15005, Co 15017 and CoSnk 15103 showed moderately susceptible (MS) reaction to Internode borer (Table-1)

Table 1: Reaction of sugarcane genotypes/varieties to major insect pest in IVT early/midlate

Sr. No	Varieties/ genotype	Early shoot borer (% incidence)						Grade	Internode borer			Grade
		30 DAS	60 DAS	90 DAS	120 DAS	cum	No. of bored plants/ha		% incidence	% intensity	Infestation index	
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Co 14005		0.00	15.45	8.77	20.61 (25.95)	37500	MS	10.00 (18.35)	0.71	0.08	LS
2	Co 15002		0.00	16.88	9.09	19.64 (26.29)	30556	MS	2.00 (7.80)	0.11	0.005	LS
3	Co15005		0.00	6.76	7.06	12.22 (20.52)	15278	LS	22.00 (26.65)	1.22	0.38	MS
4	Co 15006		0.00	13.92	13.95	23.71 (28.39)	31944	MS	4.00 (11.54)	0.37	0.02	LS
5	Co 15007		4.55	10.39	2.27	11.34 (19.56)	15278	LS	20.00 (25.44)	1.27	0.35	LS
6	CoSnk 15101		7.14	7.07	7.02	13.82 (21.48)	23611	LS	6.00 (12.16)	0.30	0.04	LS
7	CoSnk 15102		0.00	6.76	9.09	13.04 (20.87)	20833	LS	0.00 (4.05)	0.00	0.00	LS

8	CoVSI 15121		9.09	7.14	13.33	20.41 (26.88)	27778	MS	6.00 (13.98)	0.37	0.03	LS
9	Co 15009		0.00	10.23	7.41	16.67 (23.99)	20833	MS	0.00 (4.05)	0.00	0.00	LS
10	Co 15010		0.00	11.11	18.18	26.74 (30.92)	31944	MS	0.00 (4.05)	0.00	0.00	LS
11	Co 15015		4.17	3.81	3.16	8.00 (16.52)	11111	LS	8.00 (13.82)	0.48	0.08	LS
12	Co 15017		0.00	10.57	9.09	19.64 (26.65)	30556	MS	22.00 (25.38)	1.42	0.49	MS
13	Co 15018		0.00	7.78	4.21	10.78 (19.15)	15278	LS	10.00 (15.31)	0.82	0.17	LS
14	Co 15020		0.00	6.47	4.43	9.58 (17.63)	22222	LS	14.00 (21.50)	0.80	0.12	LS
15	Co 15021		0.00	12.77	9.01	17.89 (24.75)	30556	MS	8.00 (16.43)	0.41	0.03	LS
16	CoN 15071		0.00	14.00	8.60	15.00 (22.83)	20833	LS	16.00 (23.42)	1.01	0.18	LS
17	CoN 15072		5.00	6.25	4.00	7.02 (16.84)	15278	LS	0.00 (4.05)	0.00	0.00	LS
18	CoSnk 15103		5.00	2.04	4.59	20.24 (20.19)	19444	MS	22.00 (27.76)	1.90	0.45	MS
19	CoSnk 15104		0.00	8.11	11.70	21.05 (25.44)	27778	MS	6.00 (13.98)	0.32	0.02	LS
20	CoVc 15061		9.52	9.78	6.31	14.75 (22.12)	25000	LS	2.00 (7.80)	0.13	0.01	LS
21	CoVc 15062		0.00	9.18	5.98	12.70 (20.67)	22222	LS	4.00 (10.24)	0.26	0.02	LS
22	CoVc 15063		0.00	8.20	3.09	7.84 (14.65)	11111	LS	8.00 (15.90)	0.54	0.06	LS
23	CoVc 15064		0.00	19.44	7.69	16.67 (23.63)	16667	MS	4.00 (10.24)	0.21	0.02	LS
24	PI 15131		0.00	1.74	2.04	4.00 (11.15)	5556	LS	10.00 (18.35)	0.59	0.06	LS
25	PI 15132		0.00	9.18	0.00	7.89 (18.40)	12500	LS	4.00 (11.54)	0.24	0.01	LS
26	VSI 15122		0.00	7.25	5.56	11.69 (19.88)	12500	LS	8.00 (16.43)	0.58	0.04	LS
27	Co 86032(Std.)		7.41	12.20	8.91	18.58 (24.31)	29167	MS	16.00 (23.42)	1.14	0.18	LS
28	CoC 671(Std.)		0.00	19.40	6.19	15.87 (23.61)	27778	MS	16.00 (22.88)	0.42	0.06	LS
29	CoSnk 05103(Std.)		7.69	8.00	0.00	8.85 (15.83)	13889	LS	0.00 (4.05)	0.00	0.00	LS
30	Co 85004(Std.)		0.00	6.17	0.00	5.81 (14.54)	6944	LS	0.00 (4.05)	0.00	0.00	LS
S.E $\pm$												
C.D at 5%						NS			NS			
C.V												

LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible.
Figures in parenthesis are transformed values, while those outside original values.

The cumulative per cent incidence of early shoot borer was above 15.0 % inCo 86032 (Std) (20.24%) and CoC 671 (Std)(21.05%)**,** while in all other varieties/ genotypes it was below 15 % except CoN 13072 which was free from it.

The No. of bored plants/ha by early shoot borer were minimum in Co 13004(2778) and it was maximum in Co 86032 (47222) and Co 86032 (42857). The % incidence of internode borer was minimum 2.00 % in Co 13013, while it was maximum 40 % in Co 13009. The per cent intensity and infestation index of internode borer was maximum 3.27 and 1.31 in Co 13009.

The per cent incidence of mealy bug was maximum in Co 13004(28 %) and PI 13132 (22%), while Co 13002, MS 13081, Co 13006, Co 13008 Co 13014, Co Snk 13103 were free from it. All varieties/ genotypes were free from scale insect incidence. The grade of infestation of sugar cane wooly aphid was above 1.00 in Co 86032 (1.30) Co 13003 (1.43), co 13014 (1.54) and Co 13009 (2). While, CoN 13072, Co 13006, CoSnk 13103 and CoSnk 05103) were free from it.

Out of 20 varieties/ genotypes screened all varieties/genotypes showed less susceptible (LS) reaction to early shoot borer except Co 86032 and CoC 67, which showed moderately susceptible (MS) reaction. Co 13002, Co 13003, CoSNK 101, MS 13081, Co 13008 and Co 13009 showed moderately susceptible (MS) reaction to internode bore. Co 13002, MS 13081, Co 13006, Co 13008, Co 13014, CoSnk 13103 were free from mealy bug and CoN 13072, Co 13006, CoSnk 13103 and CoSnk 05103 were free from sugarcane wooly aphid infestation (Table-2).

Table-2: Reaction of sugarcane genotypes/varieties to major insect pest in AVT I plant early/midlate

S. N	Varieties/ genotype	Early shoot borer (% incidence)					Grade		Internode borer		Grade	Mealy bug		Grade	SWA	Grade
		30 DAS	60 DAS	90 DAS	Cum	No. of bored plants/ha		% incidence	% intensity	Infestation index		% incidence SMW=	% intensity SMW=		Grade	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Co 13002	0.00	12.00	7.25	14.67 (22.71)	30556	LS	30.00 (32.06)	2.33	0.99	MS	0.00 (4.05)	0.00	LS	0.07	LS
2	Co 13003	0.00	6.45	4.08	7.84 (15.54)	11111	LS	26.00 (30.51)	2.09	0.555	MS	4.00 (10.24)	0.40	LS	1.43	MS
3	Co 13004	0.00	2.86	0.00	1.37 (6.69)	2778	LS	10.00 (15.31)	0.95	0.19	LS	28.00 (26.25)	3.11	MS	0.40	LS
4	CoN 13072	0.00	0.00	0.00	0.00 (4.05)	0	LS	20.00 (21.64)	1.65	0.66	LS	16.00 (19.25)	1.75	MS	0.00	LS
5	CoSnk 13101	0.00	0.00	5.48	5.48 (11.76)	11111	LS	26.00 (30.64)	2.30	0.61	MS	6.00 (12.16)	0.64	MS	0.27	LS
6	MS 13081	5.00	4.00	7.84	11.32 (19.40)	33333	LS	26.00 (28.99)	1.98	0.77	MS	0.00 (4.05)	0.00	LS	0.17	LS
7	Co 13006	0.00	10.53	3.23	9.09 (16.58)	16667	LS	14.00 (21.62)	1.23	0.18	LS	0.00 (4.05)	0.00	LS	0.00	LS
8	Co 13008	0.00	6.12	7.06	10.23 (18.89)	25000	LS	28.00 (31.72)	2.07	0.65	MS	0.00 (4.05)	0.00	LS	0.34	LS
9	Co 13009	0.00	5.00	4.29	6.94 (14.53)	13889	LS	40.00 (39.23)	3.27	1.31	MS	6.00 (12.16)	0.32	MS	2.00	MS
10	CoC 13013	0.00	15.79	1.37	12.20 (18.60)	27778	LS	2.00 (7.80)	0.12	0.01	LS	2.00 (7.80)	0.13	LS	0.17	LS
11	Co 13014	0.00	14.81	2.08	9.62 (14.53)	13889	LS	12.00 (19.05)	1.05	0.20	LS	0.00 (4.05)	0.00	LS	1.54	MS
12	Co 13018	5.00	0.00	7.32	8.43 (16.58)	19444	LS	8.00 (16.43)	0.51	0.04	LS	8.00 (13.82)	1.25	MS	0.80	LS
13	Co 13020	0.00	6.12	3.16	6.12(14.07)	16667	LS	14.00 (18.00)	0.91	0.26	LS	4.00 (11.54)	0.24	LS	0.97	LS
14	CoN 13073	0.00	3.23	5.71	7.04 (14.53)	13889	LS	6.00 (13.98)	0.45	0.03	LS	2.00 (7.80)	0.23	LS	0.40	LS
15	CoSnk 13103	0.00	0.00	2.59	2.59 (9.04)	8333	LS	14.00 (21.50)	1.25	0.23	LS	0.00 (4.05)	0.00	LS	0.00	LS
16	CoSnk 13106	0.00	9.09	1.06	6.06 (11.49)	16667	LS	16.00 (21.74)	1.06	0.27	LS	6.00 (13.98)	0.36	MS	0.24	LS
17	PI 13132	5.00	6.25	0.00	7.02 (10.89)	11111	LS	18.00 (25.07)	1.08	0.20	LS	22.00 (27.36)	1.96	MS	0.04	LS
18	Co 86032 (Std)	5.00	2.04	18.29	20.24 (26.58)	47222	MS	8.00 (15.90)	0.47	0.05	LS	2.00 (7.80)	0.46	LS	1.30	MS
19	CoC 671 (Std)	0.00	8.11	16.67	21.05 (27.47)	33333	MS	20.00 (26.56)	1.71	0.35	LS	2.00 (7.80)	0.25	LS	0.94	LS
20	CoSnk 05103 (Std)	0.00	4.92	5.19	8.75 (16.67)	19444	LS	4.00 (11.54)	0.25	0.01	LS	2.00 (7.80)	0.12	LS	0.00	LS
	S.E ±															
	C.D at 5%				NS			NS				NS				
	C.V															

(Figures in parenthesis are transformed values, while those outside are original values.)
LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible

The cumulative per cent incidence of early shoot borer was more than 30.0 % in Co 12019, Co 12009 and Co 86032 while it was 13.92% and 17.81% in Co 12008 and Co 12024, respectively. The no. of bored plants/ha by early shoot borer were minimum 30556 in Co 12008, while it was maximum 83333 in Co 12009.

The per cent incidence, intensity and infestation index of internode borer was maximum 20%, 1.79 % and 0.41 respectively in Co 12009. Co 12024 was free from the borer. The infestation index of internode borer was below 1.0 % in all varieties/genotypes screened.

The per cent incidence of mealy bug was > 5 % in Co 12012, Co 12008, Co12009 and Co 12019. The grade of infestation of sugarcane woolly aphid was above 1.00 in Co 12008 (1.35) and Co 12012 while all other vanities / genotypes screened were free from it. All varieties / genotypes screened were free from scale insect infestation.

Pooled data indicates that the cumulative per cent incidence of early shoot borer was in the range of 15 to 30 % in all varieties / genotypes screened. The % incidence of internode borer was below 20 % in all varieties / genotypes screened. The per cent incidence of mealy bug was below 5 %in all varieties / genotypes screened. The per cent incidence of scale insect was found in VSI 12121 (0.44%), Co 12007 (0.89%) and Co 12008(1.78%).

All varieties/genotypes screened showed moderately susceptible (MS) reaction to early shoot borerand less susceptible (LS) reaction to internode borer, mealy bug and scale insect infestation (Table- 4).

Table 3: Reaction of sugarcane genotypes/varieties to major insect pest in AVT II plant early

Sr. No	Varieties/ genotype	Early shoot borer (% incidence)						Grade	Internode borer			Grade		Mealy bug	Grade	SWA	Grade
		30 DAS	60 DAS	90 DAS	120 DAS	cum	No. of bored plants/ ha		% incidence	% intensity	Infestation index		% incidence SMW=	% intensity SMW=		Grade	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Co 12007	0.00	3.85	5.10	12.99	20.24 (25.86)	47222	MS	4.00 (2.12)	0.44	0.02	LS	0.00 (0.71)	0.00	LS	0.67	LS
2	Co 12008	0.00	0.0	5.41	9.33	13.92 (20.02)	30556	LS	6.67 (2.65)	0.65	0.05	LS	6.67 (1.98)	0.60	MS	1.35	MS
3	Co 12009	0.00	0.0	21.21	21.92	34.48 (34.84)	83333	HS	20.00 (4.47)	1.79	0.41	LS	6.67 (2.39)	0.94	MS	0.38	LS
4	Co 12012	0.00	0.0	16.36	6.94	25.56 (31.29)	63889	MS	2.67 (1.65)	0.17	0.12	LS	5.33 (2.12)	0.83	MS	1.27	MS
5	Co 12019	0.00	0.0	11.27	17.95	31.91 (38.85)	41667	HS	8.00 (2.91)	0.66	0.05	LS	9.33 (3.06)	1.21	MS	0.44	LS
6	Co 12024	0.00	0.0	13.70	4.76	17.81 (23.65)	36111	LS	0.00(0.71)	0.00	0.00	LS	0.00 (0.71)	0.00	LS	0.71	LS
7	CoM 12085	0.00	4.88	8.24	9.09	28.57 (31.22)	33333	MS	14.67 (3.89)	1.16	0.17	LS	0.00 (0.71)	0.00	LS	0.89	LS
8	VSI 12121	0.00	2.04	11.54	7.58	22.78 (28.52)	50000	MS	10.67 (3.19)	1.29	0.21	LS	1.33 (1.18)	0.12	LS	0.78	LS
9	Co 86032 (Std)	0.00	0.0	32.79	10.91	34.67 (34.66)	72222	HS	6.67 (2.65)	0.98	0.07	LS	2.67 (1.65)	0.21	LS	0.91	LS
10	CoC 671 (Std)	0.00	0.0	16.36	9.76	26.00 (33.23)	36111	MS	5.33 (2.39)	0.39	0.02	LS	0.00 (0.71)	0.00	LS	0.62	LS
11	CoSnk 05103 (Std)	0.00	14.71	16.81	7.50	28.85 (25.92)	83333	MS	6.67 (2.59)			LS	2.67 (1.44)	0.49	LS	0.04	LS
	S.E +								0.38								
	C.D at 5%					NS			1.12								
	C.V								24.82								

Figures in parenthesis are transformed values while those outside are original values
LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible

Table 4: Mean Percent incidence **of major insect pests in AVT Early/Midlate (Pooled)**

Sr. No.	Variety	% incidence of ESB		% incidence of INB		% incidence of MB		% incidence of SC	
		Mean	Grade	Mean	Grade	Mean	Grade	Mean	Grade
1	Co 12007	24.26 (29.46)	MS	10.22 (3.19)	LS	2.22 (1.37)	LS	0.89 (1.07)	LS
2	Co 12008	15.34 (23.01)	MS	9.78 (3.18)	LS	2.67 (1.58)	LS	1.78 (1.39)	LS
3	Co 12009	27.45 (31.41)	MS	13.78 (3.73)	LS	2.67 (1.58)	LS	0.00 (0.71)	LS
4	Co 12012	22.85 (28.04)	MS	8.00 (2.65)	LS	2.67 (1.63)	LS	0.00 (0.71)	LS
5	Co 12019	28.07 (31.63)	MS	10.67 (3.33)	LS	3.55 (1.73)	LS	0.00 (0.71)	LS

6	Co 12024	19.23 (25.72)	MS	6.67 (2.37)	LS	0.89 (1.07)	LS	0.00 (0.71)	LS
7	CoM 12085	28.95 (32.48)	MS	13.33 (3.68)	LS	0.00 (0.71)	LS	0.00 (0.71)	LS
8	VSI 12121	17.67 (24.75)	MS	14.67 (3.86)	LS	0.44 (0.92)	LS	0.44 (0.92)	LS
9	Co 86032 (Std)	28.38 (32.01)	MS	8.45 (2.96)	LS	1.33 (1.28)	LS	0.00 (0.71)	LS
10	CoC 671 (Std)	19.06 (25.35)	MS	11.55 (3.40)	LS	1.78 (1.28)	LS	0.00 (0.71)	LS
11	CoSnk 05103 (Std)	17.10 (23.81)	MS	5.33 (2.31)	LS	0.89 (1.06)	LS	1.33 (1.18)	LS
	S.E ±								
	C.D at 5%	NS		NS		NS		NS	
	C.V								

(Figures in parenthesis are transformed values while those outside are original values)
LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible

The cumulative per cent incidence of early shoot borer was >15% in Co 12007, Co 12008, CoM 12085, Co 12009 and Co 86032.

The No. of bored plants/ha by early shoot borer was maximum 102778 in Co 12007. The Per cent incidence of internode borer was maximum 10.67% in Co 12012 while it was minimum 1.33%in CoSnk 05103 and Co VSI 12001 was free from it. The per cent intensity of internode borer was maximum 1.28 in Co 12007. While, it was minimum 0.08 in CoSnk 05103 and infestation index of internode borer was below 1 % in all varieties/genotypes screened.

The per cent incidence of mealy bug was above 5% in Co C671 (5.33) and Co 12007 (6.67). The percent incidence of scale insect was maximum 4% in Co 12008 and CoSnk 05103.

Out of 11 varieties/genotypes screened Co 12007, Co 12008, Co 12009, Co 12085 and Co 86032 showed moderately susceptible (MS) reaction to early shoot borer, Co 12007 and CoC 671 (Std) showed moderately susceptible (MS) reaction to mealy bug. All varieties/genotypes were less susceptible (LS) to internode borer and Scale insect (Table- 5).

Table 5: Reaction of sugarcane genotypes/varieties to major insect pest in AVT (Ratoon) early

Sr. No	Varieties/ genotype	Early shoot borer (% incidence)					Grade	Internode borer			Grade	Mealy bug		Grade	SI		Grad
		60 DAS	90 DAS	120 DAS	cum	No. of bored plants/ ha		% incidence	% intensity	Infestation index		% incidence SMW=	% intensity SMW =		% incidence	% intensity	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	6
1	Co 12007	3.92	12.66	11.61	27.21 (29.10)	**102778**	MS	13.33 (3.71)	1.28	0.17	LS	6.67 (1.98)	0.81	MS	2.67	0.63	LS
2	Co 12008	0.00	12.21	5.77	18.33 (24.09)	61111	MS	13.33 (3.57)	1.17	0.20	LS	1.33 (1.18)	0.09	LS	4.00	0.61	LS
3	Co 12009	0.00	11.35	5.77	18.33(23.29)	61111	MS	12.00 (3.39)	0.78	0.12	LS	0.00 (0.71)	0.00	LS	0.00	0.00	LS
4	Co 12012	0.00	2.75	7.69	10.81 (19.84)	44444	LS	18.67 (4.37)	1.26	0.24	LS	2.67 (1.44)	0.19	LS	0.00	0.00	LS
5	Co 12019	2.02	7.74	5.43	15.28 (23.25)	**61111**	MS	10.67 (3.33)	0.85	0.09	LS	0.00 (0.71)	0.00	LS	0.00	0.00	LS
6	Co 12024	2.78	6.25	6.14	12.30(19.47)	41667	LS	13.33 (3.66)	1.07	0.16	LS	2.67 (1.44)	0.24	LS	0.00	0.00	LS
7	CoM 12085	2.65	11.45	12.60	23.45 (25.08)	94444	MS	8.00 (2.91)	0.54	0.04	LS	0.00 (0.71)	0.00	LS	0.00	0.00	LS
8	VSI 12121	0.96	5.13	5.98	14.06 (21.42)	50000	LS	13.33 (3.57)	1.41	0.23	LS	0.00 (0.71)	0.00	LS	1.33	0.17	LS
9	Co 86032 (Std)	3.13	9.70	7.21	18.90(26.03)	**22222**	MS	6.67 (2.30)	0.44	0.70	LS	1.33 (1.18)	0.09	LS	0.00	0.00	LS
10	CoC 671 (Std)	1.15	2.73	4.44	8.51 (13.69)	72222	LS	13.33 (3.66)	1.07	0.16	LS	5.33 (1.82)	0.82	MS	0.00	0.00	LS
11	CoSnk 05103 (Std)	1.59	8.30	2.94	13.61 (19.42)	27778	LS	1.33 (1.18)	0.08	0.00	LS	0.00 (0.71)	0.00	LS	4.00	0.79	LS
	S.E ±							0.54									
	C.D at 5%				**NS**			1.58				NS					
	C.V							30.79									

(*Figures in parenthesis are transformed values, while those outside are original values****)***

LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible .

East Coast Zone
Regional Agricultural Research Station, Anakapalle, ANGRAU, Andhra Pradesh

During 2018-19, in AVT (Early) I plant, Two genotypes viz.,CoC 15336 and CoC 15338 were found promising against early shoot borer with 9.44% and 11.90 % incidence, respectively. compared with susceptible check, 93 A 145 recorded 25.33 % incidence. Whereas high incidence of internode borer was recorded in all the genotypes that ranged from 50.0 % (CoC 15336) to 60.0 % (CoA 15356 & 93 A 145) (Table-1).

In AVT (Early) II Plant, Two genotypes viz., CoC 14336 and CoA 14321 were found promising against early shoot borer with 9.44% and 9.74 % incidence, respectively, compared with susceptible check, 93 A 145 recorded 25.53 % incidence. Whereas high incidence of internode borer was recorded in all the genotypes that ranged from 23.33 % (CoC 14336) to 40.0 % (Co 13023) (Table-2).

In AVT (Mid late) I Plant, Two genotypes viz., CoC 14337 and PI 14377 14321 were found promising against early shoot borer with 7.55% and 9.37 % incidence, respectively. Whereas, two entries viz., Co 13028 and Co 13029 were found promising to early shoot borer and internode borer as against susceptible check 93 A 145 (Table-3).

Table-1: Reaction of AVT (Early Maturing) genotypes against Early Shoot Borer and Internode Borer

Genotype	Early shoot borer (%DH)						Internode borer	
AVT (Early) -I	30 DAP	60 DAP	90 DAP	12DAP	Cumulative upto 120 DAP	Reaction	Incidence (%)	Reaction
CO V 15356	10.51	9.34	3.36	3.22	19.45	MS	60.00	HS
COC 15336	2.80	5.04	0.51	1.86	9.44	LS	50.00	HS
Co C 15338	4.80	5.04	0.62	2.78	11.90	LS	53.33	HS
Co A 92081 (C)	6.26	3.69	3.08	2.97	14.54	LS	23.33	MS
Co C 01061 (C)	4.67	4.97	2.05	4.79	15.86	MS	43.33	HS
Co Or 03151(C)	4.96	3.75	1.1	1.06	8.94	LS	30.00	MS
93 A 145 (SC)	7.14	7.56	1.83	7.67	25.33	MS	60.00	HS

Table-2: Reaction of Advanced varietal trial (early)-II entries against early shoot borer and internode borer

Genotype	Early shoot borer (%DH)						Internode borer	
AVT (early)-II	30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence (%DH)	Reaction	Incidence (%)	Reaction
Co 13023	7.89	6.03	1.18	1.53	15.78	MS	40.00	MS
Co A 14321	3.70	3.26	0.86	3.31	9.74	LS	36.67	MS
CO C 14336	3.53	4.86	1.88	1.66	9.44	LS	23.33	MS
Co Or 03151(C)	4.96	3.75	1.10	1.06	8.94	LS	30.00	MS
Co A92081 (C)	5.72	3.52	2.20	6.77	18.58	MS	46.06	HS
Co C01061 (C)	8.80	4.93	2.10	1.05	13.48	MS	35.45	MS
93 A 145 (SC)	8.35	4.90	1.70	7.67	25.53	MS	50.91	HS
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.		Sig.	
CD (p=0.05)	1.63	1.29	0.60	1.37	3.68		15.42	

Table-3: Reaction of Advanced varietal trial (mid-late)-I entries against early shoot borer and internode borer

Genotype	Early shoot borer (%DH)						Internode borer (%)	
AVT (mid-late)-II	30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence (%DH)	Reaction	Incidence (%)	Reaction
Co 13028	7.21	3.22	2.12	2.41	15.77	MS	17.22	LS
Co 13029	3.36	3.04	6.26	3.24	11.58	LS	20.00	LS
Co13031	8.75	4.77	3.27	3.02	19.66	MS	33.33	MS
Co A 14323	8.80	6.20	1.91	3.13	16.97	MS	43.33	HS
Co C 14337	4.56	1.23	0.87	1.30	7.55	LS	36.67	MS
PI 14377	6.30	1.57	1.26	1.33	9.37	LS	50.00	HS
Co V92102 (c)	7.38	3.57	1.66	1.08	11.22	LS	36.67	MS
Co86249 (c)	4.06	3.36	2.12	0.56	9.20	LS	40.00	MS
93 A 145 (SC)	10.64	3.76	2.84	4.32	25.53	MS	50.00	HS
'F ' test	Sig.	Sig.	Sig.	Sig.	Sig.		Sig.	
CD(p=0.05)	2.60	1.82	0.91	1.08	4.85		15.38	
CV%	22.16	22.38	21.09	26.83	19.86		24.44	

SC: Susceptible check DAP: Days after planting

Insect pest	Least susceptible -	Moderately susceptible -	Moderately susceptible
ESB	0 - 15.0%	15.1 - 30.0%	> 30.1 %
INB	0 - 20.0%	20.1 - 40.0%	> 40.1%

Project E-28: Survey and surveillance of sugarcane insect-pests
North West Zone
ICAR-SBI, RC, Karnal

Insect pests survey was carried out under the reserved areas of 07 Co-operative sugar mills of Haryana namely; Karnal,Shahabad, Panipat, Rohtak, Palwal, Jind and Meham and 05 sugar mills of Uttar Pradesh and Uttarakhand viz., Triveni engineering works, Deoband, district Saharanpur(UP),Triveni engineering works, Khatauli, district Muzaffarnagar (UP),Triveni engineering worksRaninangal (UP),Triveni engineering works Sabitgarh (UP) and Triveni engineering works Milak Narayanpur, Uttarakhand (Table-1). Sugarcane whorl weevil, plant hopper and blister mites were noticed on sugarcane in Haryana, western Uttar Pradesh and Uttarakhand. The incidence of early shoot borer, top borer, root borer, stalk borer; pyrilla, black bug and termites was observed in the areas surveyed. Gurdaspur borer, Pink borer and Blister mitewere identified as minor pest of Sugarcane in Haryana, UP and UK. *Pyrilla*, army worm, grass hopper, white fly, yellow mites, mealy bug and thrips were also observed.

Table- 1: Current status of major insect pests of sugarcane

Surveyed area	Key insect pests	Minor insect	Occasional insect pests	New pest
Uttar Pradesh &Uttarakhand	WG,ESB, TB,RB, SB, BB, Termites	PB, BM, GB	Pyrilla, AW, GH,WF, YM Thrips MB,	Whorl weevil, Plant hopper, Blister mite
Haryana	ESB, TB,RB, SB, BB,Termites	PB, BM, GB	Pyrilla, AW, GH, WF, MB, YM, Thrips.	Whorl weevil, Plant hopper Blister mite

ESB= Early shoot borer, TB =top borer, RB= root borer, SB= stalk borer, BB= black bug, BM=Blister mites, WG=white grubs, AM=Army worm, GH=grass hopper, WF=white fly, YM=Yellow mite MB=mealy bug, PB=Pink borer, BM=Blister mite, INB=Internode borer GB= Gurdaspur borer, WW= whorl weevil

Table- 2: Incidence of major insect pests of sugarcane

S. No.	Surveyed area	Pop./Incidence									
		BB/ tiller	WW/ whorl	PH/ whorl	WG/ m^2	BM (%)	ESB (%)	PB (%)	TB (%)	RB (%)	SB
1	Haryana,	0.0 to 12.0	0.0 to 2.0	0.0 to 65.0	0.0to T	0.0 to 80.0	0.0 to 12.5	0.0 to 8.5	0.0 to 60.0	0.0 to 20.0	0.0 to 15.0
2	Western Uttar Pradesh	0.0 to 15.0	0.0 to 3.0	0.0 to 22.0	0.0 to 4.0	0.0 to 90.0	0.0 to 6.0	0.0 to 9.0	0.0 to 90.0	0.0 to 30.0	0.0 to 10.0
3	Uttarakhand	0.0 to 15.0	0.0 to 3.0	0.0 to 40.0	0.0 to 2.0	0.0 to 60.0	0.0 to 8.0	0.0 to 10.3	0.0 to 70.0	0.0 to 25.0	0.0 to 15.0

T= Traces, *ESB= Early shoot borer, TB =top borer, RB= root borer, SB= stalk borer,* GB= *Gurdaspur borer, BB= black bug, BM=Blister mites, WG=white grubs, GH=grass hopper, PB=Pink borer, BM=Blister mite*

The population of whorl weevil, plant hopper and blister mites was varied 0.0 to 2.0, 0.0 to 3.0 and 0.0 to 0.3 weevils/ whorl; 0.0 to 65, 0.0 to 22.00 and 0.0 to 40 adults/nymphs/ whorl and 0.0 to 80.0, 0.0 to 90.0 and 0.0 to 60.0% in Haryana, western Uttar Pradesh and Uttarakhand, respectively. Incidence of early shoot borer and pink borer was 0.0 to 12.5, 0.0 to 6.0, 0.0 to 8.0% in Haryana, western Uttar Pradesh and Uttarakhand, respectively. Top borer incidence was 0.0 to 60.0, 0.0 to 90.0 and 0.0 to 70.0% in Haryana, western Uttar Pradesh and Uttarakhand, respectively. Root borer incidence was 0.0 to 20.0, 0.0 to 30.0 and 0.0 to 25.0% in Haryana, western Uttar Pradesh and Uttarakhand, respectively. Stalk borer

incidence was 0.0 to 15.0, 0.0 to 10.0 and 0.0 15.0% in Haryana, western Uttar Pradesh and Uttarakhand, respectively. Black bug incidence varied from traces to 12.0, 15.0 and 15.0.0, individuals/ tiller in newly ratooned crops in Haryana, western Uttar Pradesh and Uttarakhand, respectively. White grub incidence varied from 0 to T, T to 4.0 grubs/$m^{2,}$T to 2.0 grubs/m^2mostly in sandy soils in Haryana, western Uttar Pradesh and Uttarakhand, respectively (Table-2)..

UP Council of Sugarcane Research, Shahjahanpur

Sugarcane fields around sugar factory viz; Gola (Lakhimpur Kheri), Hargaon (Sitapur), Kumbhi (Kheri), Rouza (Shahjahanpur), Khambarkhera (Kheri), Maqsudapur (Shahjahanpur), Nighoi (Shahjahanpur), Gularia (Kheri), Biswan (Sitapur), Pallia (Kheri) and Azabapur (Kheri) were surveyed. During hot weather, the incidence of early shoot borer was low and ranged from 1.50% (Gola, Khambarkhera, Maqsudapur, Gularia and Pallia and factory zones) to 3.00% (Hargaon, Kumbhi, and Rouza factory zones). Similarly minimum (1.50%) infestation of top borer was recorded in Khambarkhera, Maqsudapur and Pallia while maximum (4.50%) around Rouza factory zones. The infestation of stalk borer was 4.00% in Khambarkhera, Maqsudapur and Pallia factory zones to 8.00% around Kumbhi and Biswan factory zones.

Incidence of thrips was recorded in Kumbhi (5.00%), Gola factory zones (15.00%). The infestation of mealy bug was recorded low (2.50%) around gola, Kumbhi, Rouza, Khambarkhera, Maqsudapur, Gularia and Pallia factory zones while maximum (35.00%) around Biswan factory zones. Web-mite infestation was observed moderate (15.00% and 20.00%) around Gularia and Hargaon and high incidence (60.00%) was recorded around Khambarkhera factory zones (Table 1).

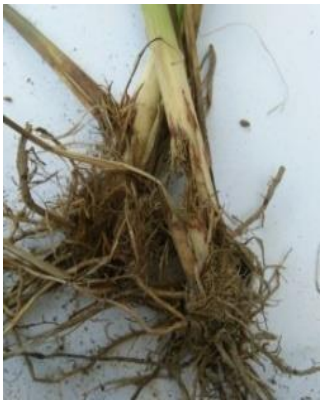
Table 1: Survey and surveillance of sugarcane insect pests in the area

S. N.	Varieties	Location	Name of pest	% incidence/population			Remark
				Minimum	Maximum	Average	
1	Co 0238,	Gola (Lakhimpur Kheri)	Early shoot borer (% incidence)	1	2	1.50	
			Top shoot borer (% incidence)	2	3	2.50	
			Thrips	10	20	15.00	
			Mealy bug	0	5	2.50	
			Stalk borer (% incidence)	6	9	7.50	
2	Co 0238, CoLk 94184 CoS 08272, Co 0118	Hargaon (Sitapur)	Early shoot borer (% incidence)	2	4	3.00	
			Top shoot borer (% incidence)	1	3	2.00	
			Webmite/leaf	15	25	20.00	
			Stalk borer (% incidence)	5	8	6.50	
3	Co 0238, Co 0118	Kumbhi (Kheri)	Early shoot borer (% incidence)	2	4	3.00	
			Top shoot borer (% incidence)	2	3	2.50	
			Thrips	4	6	5.00	
			Mealy bug	3	5	4.00	
			Stalk borer (%incidence)	7	9	8.00	
4	Co 0238, CoPk 05191	Rouza (Shahjahanpur)	Early shoot borer (% incidence)	2	4	3.00	
			Top shoot borer (% incidence)	3	6	4.50	
			Thrips	5	9	7.00	

			Mealybug	4	6	5.00	
			Stalk borer (%incidence)	4	7	5.50	
5	Co 0238, Co 0118, Co 98014	Khambarkhera (Kheri)	Early shoot borer (% incidence)	1	2	1.50	
			Top shoot borer (% incidence)	1	2	1.50	
			Stalk borer(% incidence)	3	5	4.00	
			Mealy bug	2	4	3.00	
			Webmite	50	70	60.00	
6	Co 0238, CoLk 94184	Maqsudapur (Shahjahanpur)	Early shoot borer (% incidence)	1	2	1.50	
			Top shoot borer (% incidence)	1	2	1.50	
			Stalk borer(% incidence)	3	5	4.00	
			Mealy bug	2	3	2.50	
			Thrips	6	12	9.00	
			Termite	6	9	7.50	
7	Co 0238, CoLk 98184	Nigohi(Shahjahanpur)	Early shoot borer (% incidence)	1	4	2.50	
			Top shoot borer (% incidence)	1	4	2.50	
			Stalk borer(% incidence)	6	8	7.00	
			Thrips	5	10	7.50	
			webmite	10	15	12.50	
8	Co 0238, CoS 08279 Co 98014 CoS 08272, Co 0118	Gularia (Kheri)	Early shoot borer (% incidence)	1	2	1.50	
			Top shoot borer (% incidence)	2	3	2.50	
			Stalk borer(% incidence)	5	7	6.00	
			Mealy bug	5	9	7.00	
			Thrips	4	10	7.00	
			webmite	10	20	15.00	
9	Co 0238, CoLk 94184, Co 0118, CoPk 05191, CoS 08272, CoS 08276, CoS 8436 Co 98014	Bisawan (Sitapur)	Early shoot borer(% incidence)	2	3	2.50	
			Top shoot bore (% incidence)	1	3	2.00	
			Stalk bore (% incidence)	7	9	8.00	
			Gurdaspur borer	1	2	1.50	
			Mealy bug	30	40	35.00	
			Thrips	7	12	9.50	
			White fly	5	9	7.00	
10	Co 0238, Co 98014 UP 05125, CoS 08272, CoJ 88	Pallia (Kheri)	Early shoot borer(% incidence)	1	2	1.50	
			Top shoot bore (% incidence)	1	2	1.50	
			Stalk borer(% incidence)	2	6	4.00	
11	Co 0238, Co 05011	Ajabapur (Kheri)	Early shoot borer(% incidence)	1	3	2.00	
			Top shoot bore (% incidence)	2	3	2.50	
			Stalk borer(% incidence)	3	6	4.50	
			Mealy bug	2	4	3.00	

ICAR-Indian Institute of Sugarcane Research, Lucknow

The command area of DSCL Sugar Mill, Loni was surveyed during May and July 2018. Incidence of Pokkahboeng (upto 5%) and smut (upto 10%) was observed in variety Co 0238. Incidence of red rot (15-20%) in variety Co 0238was also observed in some fields of village Adampur under Loni Sugar Mills. In few fields, early shoot borer was recorded to the tune of 15-20% in variety Co 0238. Occurrence of top borer, stalk borer, internode borer, pyrilla was in traces. In general crop condition was good in the surveyed area. The sporadic incidence of army worm (*Spodoptera* sp.) was 25-30% was observed in Bahraich. In ratoon crop, top borer was the major problem and affecting 20-25% of the shoot. A black beetle (*Heteronychus* sp.) was observed gnawing the basal portion of young shoots and causing dead hearts. Its incidence was wide spread but only around 5-10%.



Command areas of Chilbaria Sugar Mill, Nanpara Sugar Mill, Bahraich and Hata Sugar Mill, Deoria, Hata Sugar Mill, Hata, Bahraich and Hata Sugar Mill, Deoria, four units of DSCL, Group (Rupapur, Haryawan, Loni, Ajbapur), three units of Balrampur Group, Sekseria Sugar Mill, Biswan, Sitapur, Rosa Sugar Works Rosa, K. M. Sugar Mill Masodha, Oudh Sugar Mill, Hargaon, Dalmia Chini Mill, Ramgarh, IPL Chini Mill were surveyed. The incidence of ESB (30.00%), root borer (47.0%), cumulative incidence of top borer (33.33%) was observed. A black beetle (*Heteronychus* sp.) was observed gnawing the basal portion of young shoots in Chilbaria Sugar Mill, and Nanpara Sugar Mill area.

A Delphacid plant hopper *Eoeurysa flavocapitata* of sugarcane

During the course of periodic insect pests surveys in sugarcane fields in District, Muzaffarnagar of western Uttar Pradesh a black Delphacid Plant Hopper, *Eoeurysa flavocapitata* has been observed on sugarcane in *Akheypur* and *Charkheda* villagesand UCSR, Shahjahanpur. The general appearance of adults is blackish (fig-3) and of newly emerged nymphs is pale green with red eyes (Fig. 1) and advanced stage nymphs are smoky (fig-2). Both stages (adult and nymphs) are remaining concealed in leaf funnel/whorl of sugarcane and suck the plant sap. Some sort of sticky honey dew was observed on under surface of newly opened leaves that invited black sooty mould. Under surface of most of the leaves were covered with black sooty mould. In spite of yield loss to the crop it made the green cane tops unfit for cattle feed.


Fig-1: Newly emerged nymph


Fig-2: Nymph with wing pads


Fig-3: Adult Plant hopper

Fig-4: Cane top affected with black sooty mould

Peninsular Zone

ICAR-Sugarcane Breeding Institute, Coimbatore, Tamil Nadu

Fall army worm *Spodoptera frugiperda* in general is the pest of maize but it's infestation (7.2%) in one field of sugarcane was seen at Bannari Amman Sugars, Sathyamangalam. In the same field earlier crop was maize. In a sugarcane field with five rows of maize as border crop, only maize had been infested with *S. frugiperda*. Low incidence of fall army worm was noticed in an experimental field in the main campus of the Institute which ranged from nil to 7.1%. An entomopathogenic fungus recovered from *S. frugiperda* cadavers collected from the survey sites (Sathyamangalam) was identified as *Nomuraearileyi*. It is re-isolated for further tests on pathogenicity.

Table-1. Status of sugarcane pests **and their natural enemies in and around Coimbatore, Tamil Nadu**

S. No.	Variety	Location	Name of pest/ parasitoid	% incidence/population			Remarks
				Min	Max	Average	
1	Co 86032	Telungupalayam	Shoot borer	1.00	11.23	-	
			Internode borer	1.64	9.80	-	
			Top borer	0.20	1.75	-	
			Pink mealybug			-	Traces
			Scale insect			-	Traces
			Woolly aphid	1.8	2.68	-	*Micromus, Dipha, Encarsia*present
			Pyrilla	-	-	-	Traces
2	Co 86032	Athipalayam	Shoot borer	1.26	-	-	
			Top borer	0.63	-	-	
3	Co 86032	Annur	Internode borer	0.0	-	-	
			Pyrilla	-	-	-	Traces. *Epiricania* 1-2 coccons/ leaf
4	Co 86032	Sathyamangalam	White grub	0.0	36	-	No./ m length
	CoVC 14061	Sathyamangalam	Fall army worm	1.0	7.2	-	*Nomuraearileyi*
5	Co 86032	Udumalpet	Fall army worm	0.0	3.0	-	
6	Co 86032	Modakuruchi	Fall army worm	1.85	14.20	-	
7	Co 86032	Pugalur	Fall army worm	32.21	-	-	

UAS, Zonal Agricultural Resaerch Station V. C. Farm, Mandya

During 2018-19 survey was conducted at monthly interval in three sugar factory areas of Mandya district. During the survey eleven insect pests, two species of mites and two white flies was recorded on sugarcane. This year because of more rains during pre monsoon season, the incidence of early and top shoot borer was less.

For the first time egg laying by coconut white fly (*Aleurodicus rugiperculatus*) was recorded on sugarcane and maize at V.C.Farm, Mandya. Incidence of woolly aphid was moderate and it was kept under check by its natural enemies viz: *Dipha aphidivora* and *Encarsia flavoscutellum* (Table-1).

Table 1: Survey and Surveillance of insect pests of sugarcane at Mandya

Sl.No	Pest	Level of Incidence (%)
1	Early shoot borer	5.00 – 12.00
2	Top shoot borer	3.00 – 10.50
3	Internode borer	12.50 – 24.75
4	Sugarcane pyrilla	<0.50adult / nymph / clump
5	Mealy bug	18.0 % setts failed to germinate (2instances) Incidence in grownup cane 12.25 % with 20.50 % Intensity.
6	Woolly aphid	Few clumps to one gunta area (40 – 50 % leaf area covered by aphids) 13 instances.
7	Mite	10 -15 % shoots showing symptoms (12 instances)
8	White fly *N.bergi*	In traces (2 instances)
9	White fly *A.rugiperculatus*	Egg laying on sugarcane (2instances)
10	Termite	Damage in patches (2 instances)
11	Root grub	One gunta to 20gunta area affected 14 instances .larval population range 3 – 5 grubs / clump.

CSR, MPKV, Padegaon

The incidence of early shoot borer ranged from 6.5 to 32.80 per cent, whereas average incidence was recorded 12.46 per cent (Table-1). The incidence of early shoot borer was high in late suru planting as compared to adsali and pre-season plantings. The incidence of internode borer was observed at koregaon and padegaon. The incidence of internode borer ranged from 13.33 to 23.33% and intensity ranged from 0.66 to 1.67%. Incidence of *Pyrilla*, whitefly, thrips, scale insects was in traces to low. The incidence of mealy bug was ranged from 15.00 to 38.68% per cent, where as intensity ranged from 1.92 to 4.69%. Incidence of sugarcane woolly aphid (1.6 to 6.82%) observed on sugarcane in Padali and Masur (Karad). In case of soil pests, the incidence of white grub ranged from 12.0 to 48.0% particularly in Kasurdi area of Daund.

Table 1 : Survey and surveillance of sugarcane insect pests

S. N.	Variety	Location	Name of pest	% incidence/Population			Remark
				Min.	Max.	Average	
	Co 86032 CoM 0265 MS 10001	Karajgaon, Watapur, ganeshwadi (Newsa), Dhamner (Koregaon), Padali, Masoor (Karad) Padegaon (Phaltan), Padegaon (Khandala), Ashsta (Sangali) Kagal (Kolhapur) Kasurdi (Daund)	Early shoot borer (% incidence)	6.5	32.82	12.46	Padegaon
			Top shoot borer (% incidence)	0	3.00	0.10	Ashta
			Internode borer -% incidence (% intensity)	13.33 (0.66)	23.33 (1.67)	16.67 (4.20)	Koregaon
			Stalk borer (% incidence/% intensity)	--	--	--	
			Root borer (% incidence)	2.00	6.00	3.44	Padegaon
			Any other borer (% incidence)	--	--	--	
			Pyrilla/ leaf	02	05	--	Rare incidence
			Epiricania melanoleuca/plant	0.7	1.6	--	
			Whitefly (per 2.5 sq.cm.)	0	1.30	--	very rare incidence
			Woolly aphid (Average grade)	1.6	6.82	4.66	Padali, Masur (Karad)
			Scale insect (% incidence/% intensity)	4.67	10.00	02.67	Padegaon
			Mealy bug - % incidence / (% intensity)	15.00 (1.92)	38.68 (4.69)	26.40 (3.30)	Padegaon
			Black bug/leaf	--	--	--	
			Spittle bug (% incidence)	--	--	--	
			Thrips (% incidence)	--	--	--	In traces
			Mite (% incidence)	--	--	--	
			White grub	12	48	18.22	Kasurdi (Daund)
			Termite (% incidence) At germination/harvest	1.20	7.10	1.33	Koregaon
			Sugarcane grass hopper, *Hieroglyphus banian*	0.54	1.88	0.66	In traces
			Any other (New Pest)	--	--	--	--

Vasantdada Sugar Institute, Pune

Incidence of early shoot borer was up to 10.71% in ratoon crop of Co 86032 in the month of December, 2018. The incidence of internode borer was up to 8.00% in Co 86032 planted in the month of July, 2018. The 25% % incidence of root borer was observed in December, 2018 ratoon crop of Co 86032 (Table-1).

Table 1 : Percent incidence / intensity of major pest at Daund Sugar Pvt .Ltd Dist. Pune

Sr. No	Name of the Farmer	Village	Variety	Date of planting/ ratoon	Name of the pest			
					Early shoot borer	Root borer	Internode borer	
					% Inci.	% Inci.	% inci	% intern
1	Mr. Kale KisanPandarinath	Alegaon	Co 86032	6.12.2018 Ratoon	10.71	-	-	-
2	Mr. KlaeKIsanBapurao	Alegaon	Co 86032	1.7.2018	-	-	0	0
3	Mr. Dhumal Ashok Maruti	Alegaon	CoM265	1.7.2018	-	-	0	0
4	Mr. DhumalKalidasShivaji	Alegaon	VSI08005	9.12.2018 Ratoon	0	-	-	-
5	Mr. Kadam	Alegaon	CoM265	30.11.2018 Ratoon	0	-	-	-
6	Mr. WagmarePremaRamchandra	Vadgaondarekar	CoM265	1.7.2018	-	-		
7	KapseAppasahebShantarm	Vadgaondarekar	Co 86032	10.11.2018 Ratoon	0.97	-	-	-
8	WagmareYeshwant Bali	Vadgaondarekar	CoM 265	1.7.2018	0	-	4	0.30
9	Mr. KapseDnyandevShantaram	Vadgaondarekar	Co 86032	25.12.2018	2.73	-	-	-
10	WagmareShahajiZumber	Vadgaondarekar	CoM265	15.9.2018	-	-	4	1.20
11	Jagtap Santosh Jaysingh	NimgaonKhalu	VSI 08005	25.12.2018 Ratoon	4.37	-	-	-
12	Jagtap Santosh Jaysingh	NimgaonKhalu	Co 86032	1.07.2018	-	-	8	2
13	MachaleDilipVaman	NimgaonKhalu	Co 86032	12.11.2018 Ratoon	9.66	25	-	-
14	ThoratRajendraKeshav	Kautha	Co 86032	1.07.2018	-	-	8	0.51
15	AtoleSayaiiappa	Ravangaon	CoM265	14.2.2019 Ratoon	2.90	-	-	-
16	AtoleVijaykumar S.	Ravangaon	MS10001	14.2.2019 Ratoon	2.89	-	-	-
17	AtoleBalaso T.	Ravangaon	CoM265	1.02.2019 Ratoon	4.88	-	-	-
18	AtoleTusharShivaji	Ravangaon	CoM265	16.08.2018	-	-	4	0.35
19	AtoleKantilalaKalyan	Malad	CoM265	19.09.2018	-	-	0	0
20	AtoleJanabaiUttam	Malad	CoM265	24.12.2018 Ratoon	2.60	-	-	-

East Coast Zone

Regional Agricultural Research Station, Anakapalle,ANGRAU, Andhra Pradesh

During 2018-19, roving surveys were conducted in Visakhpatnam, Viziangaram and East Godavari districts during crop season and observed incidence of **oriental thrips** (***Fulmekiola serrata*** **Kobus**) on tender leaves in central whorls of the sugarcane (3-6 thrips/leaf) during April- May months. Maximum incidence of early shoot borer (30-50%) was observed on single node seedlings of 87 A 298 at 30 days after transplantation during the month of June at Kovvada village of Vizinagaram district and Maximum incidences of aphids *viz.*, sugarcane aphid, *Melanaphis sacchari* (30-50/leaf) and rusty plum aphid, *Hysteroneura setariae* (30-40/leaf) were observed during the month of August at Lakkavaram village of Visakhapatnam. Maximum incidence of internode borer was observed during August month (50-70%) on 20003 A 255 variety at

Lakkidam village of Vizianagaram district. Maximum incidences of scale insect, *Melanaspis glomerata* (60-80%) was observed on variety, 87 A 298 (ratoon crop) and white woolly aphid, *Ceratovacuna lanigera* (20-50%) were observed during January- February months. In case of whitefly, along with *Aluerolobus barodensis* another whitefly species *Neomaskellia bergii* (Spotted whitefly) was also observed during the crop season with maximum incidence during August month (15-40 adults/leaf). Incidence of cut worm, *Agrotis* spp (20- 40%) in some isolated pockets of Srikakulam district after receding of flood water due to Titli cyclone occurred during 1st week of October. Incidence of **Fall army worm, *Spodoptera frugiperda*** was observed for the first time in Research farm of RARS, Anakapalle on 6-3-2019 and confirmed morphologically. The incidence gradually spread in many experimental fields planted during March at research station (5-10%). Extracted DNA from the fall army worm larval samples collected on sugarcane and amplified DNA by PCR was sent for sequencing and also confirmed molecularly that it is fall army worm, *Spodoptera frugifperda*. (Table-1).

Table 1 Survey and surveillance of sugarcane insect pests during

Period of Visit	Varieties	Location	Name of the insect pest	Incidence (%) /population of major insect pests			Remarks
				Min.	Max.	Average	
April,18	87 A 298	Arabupalem, Munagapaka,, Vadrapalli in Munagapaka mandal, Visakhapatnam district	Early shoot borer, *C. infuscatellus* (%DH)	6.0	17.0	11.5	Due to high temperatures low to moderate incidence of early shoot borer was observed on all commercial varieties
			Oriental thrips, *Fulmekiola serrata* Kobus (thrips/leaf)	3.0	6.0	4.5	
			Red mite, *O. sacchari* (%)	2.0	4.0	3.0	
May,18	87 A 298 (Ratoon)	Arabupalem, Munagapaka,, Vadrapalli in Munagapaka mandal, Visakhapatnam district	Early shoot borer (%)	3.0	12.0	7.5	
			Mealybug, *S. sacchari* (%)	3.0	13.0	8.0	
			Sugarcane aphid, *M. sacchari* (N & A/leaf)	4.0	12.0	8.0	
July,18	2003 V 46 (June planting)	Sitharamapuram (V) Tondangi (M)	Early shoot borer (%DH)	1.0	3.0	1.5	
	87 A 380	P.Chemavaram	Mealybug, *S.sacchari* (%)	5.0	10.0	7.5	
	87 A 298 (8th Ratoon)	Kandrakota Siriwada	Sugarcane aphid, *M.sacchari* (No/ leaf) Rusty plum aphid, *H.setariae* (No/leaf)	15.0 15.0	20.0 24.0	17.5 18.5	
	Co 62175 (Ratoon)	Jutthada	Internode borer(%) *C. sacchariphagus indicus*	5.0	20.0	12.5	
	87 A 298(Plant)	Lakkavaram	Early shoot borer (%) *C.infuscatellus*	30.0	40.0	35.0	Rainfed sugarcane
	87 A 298 (Ratoon)		Rusty plum aphid, *H. setariae* (aphids/leaf)	10.0	20.0	15.0	Mosaic disease was observed
			Mealy bug, *S. sacchari* (%)	5.0	10.0	7.5	
August, 2018							

Visakhpatnam district	Co 7508 87 A 298	Lakkavaram	Rusty plum aphid/leaf *Neomaskella bergii /leaf*	20.0 15.0	40.0 40.0	30.0 27.5	severe incidence of YLD (on Co 7508) was observed
	Sugarcane 87 A 298	Nakkapalli	Sugarcane aphid (A &N/leaf) *M.sacchari*	30.0	50.0	40.0	Mosaic incidence was observed
			Pyrilla (Adult/ egg masses/leaf)	1.0	2.0	1.5	
Vizianagaram district	Co 7508 87 A 298	Lakkidam (v) in Gantyada (M)	*C. infuscatellus* damage on internodes (%)	30.0	50.0	40.0	
	2003 A 255 (Plant crop)		Pink mealy bug(%) *S. sacchari*	5.0	10.0	7.5	
	2000 A 56 (Plant crop)		Internode borer (%) *C. infuscatellus*	10.0	20.0	15.0	
	2009 A 107 (Plant crop)		Internode borer (%) *C. infuscatellus*	10.0	20.0	15.0	Grassy shoot disease was observed
	2003 A 255 2009 A 107 (Plant crop)	Jami (v) in Jami (M)	Sugarcane aphid (A&N/leaf) *M.sacchari*	50.0	60.0	55.0	Mosaic incidence (2%)
			Rusty plum aphid (A &N /leaf) *H.setariae*	60.0	100.0	80.0	
	87 A 298 (Plant crop)	Jami (v) in Jami (M)	*Pyrilla perpusilla* /leaf	1.0	2.0	1.5	Severe incidence of mosaic disease (60%)
	2009 A 107 (Plant crop)		*Pyrilla perpusilla*/leaf	1.0	2.0	1.5	Low incidence of mosaic incidence (2%)
September, 2018							
Visakhapatnam district	87 A 298	Sithanagaram village of Vizianagaram	Internode borer, *C.sachriphagus indicus* (%)	10.0	12.0	11.0	Observed severe incidence of mosaic disease on 87 A 298 (ratoon) (40-60%) Incidence of grassy shoot (1-2%) Moderate to severe incidence of YLD (30-50%) were observed
	Sugarcane 2003 A 46 (ratoon)	Makaravapalem	*Pyrilla perpusilla (Adult/ egg masses/leaf)*	1.0	2.0	1.5	
	Co 7508 (Ratoon)	Lakkavaram v) in Chodavaram (M)	Rusty plum aphid, *H. setariae*/leaf	10.0	20.0	15.0	
			Neomaskella bergii /leaf	5.0	7.0	6.5	
			Internode borer, *C.sachariphagus indicus* (%)	5.0	10.0	7.5	
	87 A 298 (ratoon)	Lakkavaram(v) in Chodavaram (M)	Internode borer (%) (*C. sacchariphagus indicus*)	10.0	20.0	15.0	Severe incidence of mosaic (> 60%) was observed
	87 A 298	Bennavaram East Godavari district (M/s Thanda Coop. sugars ltd., Payakarao peta)	Spotted whitefly, *N.bergii (Adults/leaf)*	5.0	13.0	9.0	

	Sugarcane (87A 298) –ratoon crop	Kolimeru (v) in Tuni (M)	Internode borer , *C. infuscatellus* (%)	10.0	20.0	15.0	Severe incidence of mosaic disease (60%)
	87 A 298 (Ratoon crop)		*Pyrilla* (1-2/leaf)	5.0	10.0	7.5	
			Yellow mite (*Schizotetranichus* spp) (%)	5.0	6.0	5.5	Low incidence of mosaic incidence (2%)
October, 18	87 A 298	Thummapala (v) Anakapalle (M)	Spotted whitefly,*N.bergii (Adults/leaf)*	8.0	10.0	9.0	30-40% incidence of mosaic disease on 87 A 298 Ratoon crop
			Internode borer (%)	5.0	10.0	7.5	
	87 A 298	In some isolated pockets of Srikakulam district	Cut worm, *Agrotis* spp (% incidence)	20	40	30.0	Observed after receipt of flood water due to titli cyclone
			Pyrilla perpusilla (A&N/leaf),	7.0	10.0	8.5	
			Derbid leaf hopper, *Proutista moesta* (A/leaf),	3.0	6.0	4.5	
			Pink mealy bug, *S. sacchari (%)*	5.0	15.0	10.0	
			Rusty plum aphid, *H.setarie (*A&N/leaf),	8.0	10.0	9.0	
			Sugarcane aphid, *M. sacchari* (A&N/leaf)	5.0	15.0	10.0	
			Spotted whitefly, *N. bergii* (6-13 adults/leaf)	6.0	13.0	9.5	
November, 18	87 A 298	Sithanagaram village of Vizianagaram	Internode borer	10.0	12.0	11.0	Severe incidence of mosaic disease on 87 A 298 (ratoon) (40-60%)
	2003 A 255		Internodeborer	10.0	15.0	12.5	
	87 A 298	Bobbili	Spotted whitefly, *N.bergii* (Adults/leaf)	8.0	13.0	10.5	
			Pyrilla perpusilla/leaf	1.0	2.0	1.5	
December, 18	2000 A 225	Vaddadi	Internode borer (%) *C.sachariphagus indicus*	5.0	15.0	10.0	
	87 A 298	Bennavaram	Spotted whitefly, *N.bergii (Adults/leaf)*	5.	13.0	9.0	
January,19	2009 A 107	Arabupalem & Research station, Anakapalle, Visakhapatnam	Whitefly, *A.barodensis* (puparia/2.5cm leaf area)	16.0	30.0	23.0	
	93 A 145, 2009 A		White woolly aphid, *Ceratovacuna*	25.0	50.0	35.0	

	107		*lanige*ra (%)				
	87 A 298, 2001 A 63, 93 A 145(Ratoon)		Scale insect (%) *M. glomerata*	17.0	70	43.5	
	2009 A 107		Sugarcane aphid (A & N/ leaf), *M. sacchari*	6.0	15	10.5	
February, 19	87 A 298 mature crop (Ratoon crop)	Bejjupalem village in Srikakulam	Internode borer (%) *C.sachariphagus indicus*	15.0	20	12.5	
			Scale insect (%) *M.glomerata*	50.0	60	55.5	
			White woolly aphid (%)	20.0	50	35.0	
March, 19	87 A 298, 2009 A 109, 93 A 145 *etc*	In isolated patches in RARS, Anakapalle, Chuchukonda, Visakhpatnam district. In some parts of East Godavari district	Fall army worm, *Spodoptera frugiperda* (%)	5.0	10	7.5	First appearance on sugarcane crop during 2019.

Project E-30: Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem

North West Zone

ICAR- SBI, RC, Karnal

A non-replicated experiment with sugarcane variety, Co 0238 was carried out and monitored the incidences of major insect pests and their bio agents of sugarcane at regular interval. Pink borer emerged a new insect pest of sugarcane.

Table-1: Prevalence of Insect pests of sugarcane and their bio- agents

S.No.	Insect-pests	Incidence / Population	Bio- agents	Parasitisation (%)
1.	Pink borer	9.0%	-	-
2.	Early shoot borer	2.3 **%**	-	-
3.	Top borer	8.6%	*Isotima javensis*	2.3 (Larvae)
			Stenobracon deesae	1.6(Larvae)
4.	Root borer	12.6%	-	-
5.	Termite	4.4%	-	-
6.	Black bug	13.0/tiller 1.9(Nymph & Adult)/cane	-	-
7.	Stalk borer	incidence - 24.8 % intensity - 11.5 % Infestation index - 2.8	*Cotesia flavipes*	3.3(Larvae)
8.	Pyrilla	(0.2 individual/20leaves).	*Epiricania melanoleuca*	2.6 (Nymph and adults)
			Tetrasticus pyrillae.	3.3 (eggs)

The cumulative incidence of pink borer right from shoot stage till harvest of the crop was 9.0 per cent. The incidence of early shoot borer and top borer was below ETL (<15.0 and <10%, respectively). Root borer and termite incidence was 12.6 and 4.4.0%, respectively. It was also observed that black bug, a sucking pest of sugarcane infested the sugarcane plant crop during July to October. The mean population of black bug was 1.9/tiller in ratoon and 13.0/canes in plant crop. Stalk borer incidence, intensity and infestation index were 24.8%, 11.5% and 2.8, respectively. The Pyrilla population was 0.2 individual / 20 leaf. Among bio-agents, *Epiricania melanoleuca,* identified as an effective parasitoid of *Pyrilla* with 2.6 per cent parasitisation. *Tetrasticus pyrillae,* an egg parasitoid of *Pyrilla*, parasitized 3.3 per cent egg masses. *Isotima javensis* and *Stenobracon deesae*parasitisation of top borer larval parasitisation was 2.3 and 1.6 per cent respectively. *Cotesia flavipes* parasitisised 3.3 % stalk borer larvae.

UPCR, Shahjahanpur

An on station experimental trial was conducted in 0.2 ha area with UP 05125 cultivars to monitor insect pests of sugarcane and their bio-agents. The incidence of early shoot borer was recorded maximum 5.20% during 24th SMW followed by 4.00%, 3.00% and 2.60% during 20th, 29th and 16th SMW, respectively. The incidence of top borer was recorded maximum 4.50% during 35th SMW followed by 3.20%, 3.00%, 1.50% and during 31st , 26th, 22nd and 38th SMW, respectively. The percent incidence of stalk borer (on cane basis) was recorded maximum 17.50% during 43rd followed by 13.25% during 38th SMW, respectively.

The bio-agents viz., *Telenomus beneficiens, Isotima javensis, Rhaconotus scirpophagae* and *Stenbracon deesae* were recorded as major parasitoids of top borer. *Cotesia flavipes*, a larval parasitoid of stalk borer was also recorded from fields.

The peak activity of egg-parasitoid, *T. beneficiens* was observed to be 10.00% during 31st SMW and declined up to 2.50% during 35th SMW. A parasitisation of larvae by *Isotima javensis* was observed from 22nd SMW (1.00%) and increases up to 4.00% during 31th SMW thereafter decreases up to 1.00%

during 38th SMW. The parasitisation of top borer by *Rhaconotus scirpophagae* was recorded minimum (1.00%) during 26th SMW which increased up to 4.00% during 35th SMW thereafter decreases up to 1.50% during 38th SMW. The parasitisation of *Stenobracon deesae* was ranged from 1.50% during 31st SMW to 3.10% during 38th SMW. The parasitisation of stalk borer larvae by *Cotesia flavipes* was recorded maximum 9.10% during 43rd SMW (Table 1a, b).

Table 1a: Monitoring of insect pest and natural enemies of sugarcane

Period of observation Dates + SMW	**% incidence early shoot borer**	**% Paraitism (ESB)**		**% incidence stalk borer**	**% Parasitism (stalk borer)**
		T. chilonis	***E. annulipes***		***Cotesia flavipes***
1	**2**	**3**	**4**	**5**	**6**
16-04-18 16th SMW	2.60	-	-	-	-
18-05-18 20th SMW	4.00	-	-	-	-
17-06-18 24th SMW	5.20	-	-	-	-
20-07-18 29th SMW	3.00	-	-	-	-
20-08-18 34th SMW	-	-	-	-	-
22-09-18 38th SMW	-	-	-	13.25	5.00
25-10-18 43rd SMW	-	-	-	17.50	9.10
19-11-18 47th SMW	-	-	-	-	-

Table 1b: Monitoring of insect pest and natural enemies of sugarcane

Period of observation Dates & SMW	**% incidence top shoot borer**	**% Parasitism (top shoot borer)**						
		T. beneficiens	***I. javensis***	***A. flavipes***	***Rhanconotus scripophagae***	***Elasmus zehntneri***	***S. deesae***	***B. bassiana***
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
16-04-17 16th SMW	-	-	-	-	-	-	-	-
30-05-17 22nd SMW	1.50	1.00	1.00	-	-	-	-	-
28-06-17 26th SMW	3.00	3.50	1.15	-	1.00	-	-	-
30-07-17 31st SMW	3.20	10.00	4.00	-	2.00	-	1.50	-
28-08-17 35th SMW	4.50	2.50	3.00	-	4.00	-	2.10	-
20-09-17 38th SMW	1.00	-	1.00	-	1.50	-	3.10	-
25-10-17 43rd SMW	-	-	-	-	-	-	-	-

ICAR-IISR, Lucknow

Experiment on monitoring of insect pests of sugarcane was carried out with CoLk 94184. Planting was done in October 17, 2017. Recommended agronomic practices were followed to raise a good crop. Average germination was recorded 44.51 percent. Periodic observations on incidence of insect pests and parasitoids of pests were recorded. Due to termites, bud damage ranged from 10.00 to 25.00 per cent. Per cent cut end damage of sett was high but in most of the cases buds were intact. Complete sett damage was 0.5 to 1.0 % and live workers were also seen (5 to 25 per sett).

Incidence of top borer I, II, III and IV brood was 16.28 to 27.79, 14.25 to 23.11, 5.36 to 30.47 and 5.24 to 18.64 percent, respectively. Incidence of root borer was 11.76 to 52.94 per cent in September.

Incidence of internode borer was 0.00 to 43.47, while the incidence of stalk borer was 8.69 to 58.33 percent. The incidence of *Pyrilla perpusilla* was in traces and its adult and nymph parasitoid, *Fulgoraesia* (*Epiricania) melanoleuca* was also noticed. Mealy bug and black bugs were present in every clump. Parasites like *Telenomus beneficiens* (65.0 % on egg mass basis). Total parasitisation of top borer was 33.33 %. due to *Stenobracon* sp. (4.76%), *Rhaconotus* sp. (18.81%) and *Isotima javensis* (10.39%) and predatory fauna comprising of Coccinellids, spiders and ants were noticed active in the field at different stages of the crop.

Table 1: Incidence of different insect pests of sugarcane

Top borer

Period of Observation	Incidence of top borer (%)	% parasitisation (Top borer)								
		T. japonicum	*T. chilonis*	*T. beneficiens*	*I. Javensis*	*Cotesiaflavipes*	*Rhaconotusscirpophagae*	*Elasmuszehntneri*	*S. desae*	*B. bassiana*
1	2	3	4	5	6	7	8	9	10	11
I brood 15-02-18(6th week)	16.28 to 27.79									
II brood 10-05-18(19th week)	14.25 to 23.11	-	-	30.0 on egg mass basis	-	-	-	-	0.0	-
III brood 10-06-18 (23rd week)	5.36 to 30.47	-	-	26.67 On egg mass basis	10.39	-	9.00	-	4.76	-
IV brood 17-09-2018(38th week)	5.24 to 18.64	-	-	14.33 On egg mass basis	-	-	9.81		-	-

Internode and root borer

Period of Observation	Incidence of internode borer	**% parasitisation**				Period of Observation	Incidence of Root borer	% parasitisation		
		T. chilonis	*T. japonicum*	*Cotesiaflavipes*	*B. bassiana*			*T. chilonis*	*Cotesiaflavipes*	*B. bassiana*
1	2	3	4	5	6	1	2	3	4	5
19-09-18(35th week)	0.00 to 43.47	-	-	Traces	-	7-7-18	10.00 to 15.00	-	-	-

Stalk borer and Mealy bug

Period of Observation	Incidence of stalk borer	**% parasitisation**				Period of Observation	Incidence of Mealy bug	% parasitisation		
		T. chilonis	*T. japonicum*	*Cotesia flavipes*	*B. bassiana*			*T. chilonis*	*Cotesia flavipes*	*B. bassiana*
1	2	3	4	5	6	1	2	3	4	5
20-08-18(33rd week)	8.69 to 58.33	-	-	-	-	11-10-17	100.0 on cane basis	-	-	-

Pyrilla perpusilla

Period of Observation	Incidence of P. perpusilla			% Parsitisation				
	No. of adults/leaf	No. 0f nymphs/leaf	No. of egg mass/leaf	*Epiricaniamelanoleuca*			Tetrastichuspyrillae	Lestrodryinuspyrillae
				Cocoon	Egg mass	Adults	% parasitisation On egg mass basis	% parasitisation On egg mass basis
1	2	3	4	5	6	7	-	-
20-07-2018 (29th Week	0-1	-	-	-	-	-	-	-
22-08-2018 (34th Week)	0-1	0-1	0-1	0-1	0-1	-	-	-
10-10-18 (41Week)	traces	traces	-	traces	-	-	-	-

Peninsular Zone
Dr. PDKV, Akola

Early shoot borer: The seasonal incidence (Table-3) revealed that the damage due to early shoot borer was initiated during the 7th meteorological week i.e. 12th Feb 2018 (10.47% dh) and it was continued up to 30th MW. The maximum damage due to early shoot borer was observed during 7th MW i.e. 12th Feb 2018 (10.47% dh) during which met parameters were in the range of 29.9 to 14.9^{0}C temperature, 70 to 35% RH and 0.7 mm rainfall.

Scales: The incidence of scales was initiated during 37th MW (40% incidence and 8.18% intensity) and it was continued up to 52nd MW. The % incidence and % intensity increased at 37th MW and then % intensity decreased but the % incidence of scales increased during last met week and was maximum on 37th, 39th, 40th and 41st MW (40%).

***Pyrilla*:** The incidence of *Pyrilla* was initiated during 30th MW (0.78 per leaf) and it was continued up to 42nd MW. The maximum *Pyrilla* per leaf was observed on 35th MW (2.25 per leaf, respectively).

Aphids : The meager population of aphids was noticed. The incidence started from 27th MW and it was continued up to 47th MW the maximum incidence was noticed on 33rd MW i.e. 27 aphids per 3 leaves.

White fly: The meager population of White fly was noticed. The incidence started from 27th MW and it was continued up to 46th MW the maximum incidence was noticed on 41st MW i.e. 9 white flies per 3 leaves.

Natural Enemies: The natural enemies such as Ladybird beetles and spiders were observed from 7th MW and continued up to 52nd MW.

Table 1: Correlation of incidence of insect pests on sugarcane at Akola with the weather parameters during the year

Variety		Rainfall (mm)	Max. Temp	Min. Temp	RH I (%)	RH II (%)
Early shoot borer						
Co 86032	**r**	-0.12	0.52	0.55	-0.66	-0.66
	t (cal)	-0.80	3.99	4.27	-5.67	-5.73
	n=24	**NS**	**NS**	**NS**	**NS**	**NS**
Scales						
Co 86032	r	-0.26	-0.33	-0.95	0.33	-0.05
	t (cal)	-1.72	-2.24	-20.43	2.29	-0.31
	n=16	**NS**	**S**	**S**	**S**	**NS**
Pyrilla						
Co 86032	**r**	0.17	-0.37	0.22	0.51	0.60
	t (cal)	1.13	-2.54	1.47	3.81	4.84
	n=13	**NS**	**S**	**NS**	**S**	**S**

Here r= coefficient of correlation, t = calculated t NS = Non significant
S = significant at 0.05%* and 0.01%**

Pests incidence, (Table-2) revealed that the early shoot borer incidence on Co-86032 has shown non-significant correlation with morning relative humidity, evening relative humidity, rainfall and Maximum temp. Similarly, in case of scales the incidence of scales has also shown non-significant correlation with rainfall and Relative humidity at evening. But it showed significant correlation with relative humidity at morning hours, Max. Temperature and Min. Temperature. In case of *Pyrilla* it showed significant correlation with Relative humidity at morning and evening hours and Max. Temperature and non-significant with Min. temperature and rainfall.

Table 2: Seasonal incidence of major insect pests of sugarcane recorded during

Sr.No.	Insect Pests	Infestation period (MW)	Highest infestation	Meteorological parameters				
				RF (mm)	**T max ºC**	**T min ºC**	**RH I (%)**	**RH II (%)**
1	Early Shoot Borer % infestation	7^{th} to 30^{th} MW	(10.47%) 7^{th} MW	0.7	29.9	14.9	70	35
2	*Pyrilla* per leaf	30^{th} to 42^{nd} MW	(2.25 per leaf) 35^{th}	1.0	28.5	23.4	88	70
3	Scale insect % incidence	37^{th} to 52^{nd} MW	(40%) 37^{th} MW	0.0	32.6	24.0	81	48
4	Scale insect % intensity	37^{th} to 52^{nd} MW	(8.71%) 46^{th} MW	0.0	33.3	14.0	66	20

Table 3: Seasonal incidence of major insect pests and natural enemies of sugarcane Recorded on Co-86032

Sr. No	MW	Per cent infestation of early shoot borer	Per cent incidence of scales	Per cent intensity of Scale insects	Bio agents per 3 plants		Aphids per 3 leaves	White fly per 3 leaves	*Pyrilla* Nymph adult per leaf	Rain fall (mm)	Temperature (0C)		RH I (%)	RH II (%)
					LBB	Spiders					Max	Min		
1	1	--	--	--	--	--	--	--	--	0.0	29.5	9.4	74	23
2	2	--	--	--	--	--	--	--	--	0.0	29.6	12.3	58	23
3	3	--	--	--	--	--	--	--	--	0.0	31.3	12.1	68	20
4	4	--	--	--	--	--	--	--	--	0.0	29.8	10.0	57	20
5	5	--	--	--	--	--	--	--	--	0.0	32.4	10.9	58	15
6	6	--	--	--	--	--	--	--	--	0.0	32.3	16.0	48	20
7	7	10.47	--	--	6	4	--	--	--	0.7	29.9	14.9	70	35
8	8	9.38	--	--	11	7	--	--	--	0.0	35.5	17.9	48	18
9	9	8.64	--	--	5	7	--	--	--	0.0	37.3	18.5	40	13
10	10	8.47	--	--	11	6	--	--	--	3.0	36.7	22.1	37	20
11	11	7.87	--	--	14	7	--	--	--	0.4	34.7	20.3	56	18
12	12	6.42	--	--	9	6	--	--	--	0.0	37.7	20.4	36	14
13	13	6.12	--	--	14	3	--	--	--	0.0	41.1	20.0	27	7
14	14	7.41	--	--	11	7	--	--	--	0.0	40.9	22.7	27	11
15	15	6.99	--	--	08	5	--	--	--	0.3	40.4	24.5	45	16
16	16	5.00	--	--	07	7	--	--	--	0.0	42.3	27.8	30	12
17	17	4.63	--	--	08	7	--	--	--	0.0	42.9	26.4	28	7
18	18	4.72	--	--	11	10	--	--	--	0.0	43.5	28.8	37	13
19	19	3.89	--	--	5	7	--	--	--	0.5	43.7	29.3	30	11
20	20	4.01	--	--	7	7	--	--	--	0.0	43.5	31.1	34	14
21	21	3.56	--	--	4	4	--	--	--	0.0	44.3	31.1	41	18
22	22	3.89	--	--	3	8	--	--	--	8.5	43.1	29.5	50	23
23	23	2.99	--	--	5	4	--	--	--	72.5	37.5	25.5	73	44
24	24	2.70	--	--	7	2	--	--	--	17.5	37.7	26.5	66	31
25	25	3.63	--	--	5	2	--	--	--	83.1	36.0	24.6	80	49
26	26	2.89	--	--	3	5	--	--	--	111.0	32.3	23.7	86	56
27	27	2.12	--	--	3	7	3	2	0.00	54.8	32.7	24.3	83	61
28	28	2.10	--	--	7	5	8	4	0.00	140.3	28.4	23.6	93	80
29	29	1.49	--	--	3	6	5	3	0.00	35.1	29.9	24.1	88	71
30	30	1.42	--	--	5	6	5	3	0.78	30.7	28.0	23.5	90	74
31	31	0.00	--	--	4	7	13	7	1.00	3.2	32.2	24.2	81	56
32	32	0.00	--	--	4	4	18	4	1.00	4.8	30.8	24.3	84	65
33	33	--	--	--	5	3	27	7	1.60	97.8	29.4	24.0	89	74
34	34	--	--	--	4	3	9	4	1.70	106.4	27.6	22.6	91	77
35	35	--	--	--	5	4	10	4	2.25	1.0	28.5	23.4	88	70
36	36	--	--	--	7	5	9	5	1.00	1.0	29.8	21.9	84	56
37	37	--	40.00	8.18	8	4	11	5	1.30	0.0	32.6	24.0	81	48
38	38	--	30.00	6.87	8	3	9	5	1.40	62.4	33.3	23.1	85	52
39	39	--	40.00	6.16	9	4	10	5	0.46	0.0	33.6	22.7	85	49
40	40	--	40.00	6.22	7	5	7	7	0.83	0.0	35.1	21.3	78	38
41	41	--	40.00	5.26	8	5	9	9	1.50	0.0	35.4	18.6	77	29
42	42	--	40.00	5.26	8	6	10	6	1.45	0.0	34.8	19.3	72	30
43	43	--	20.00	6.03	9	7	9	5	0	0.0	35.3	17.1	68	22
44	44	--	20.00	5.96	9	8	8	6	0	0.0	33.4	18.1	68	32
45	45	--	30.00	5.93	10	7	10	7	0	0.0	33.6	16.5	76	28
46	46	--	20.00	8.71	9	6	9	2	00	0.0	33.3	14.0	66	20

47	47	--	30.00	6.05	8	7	8	0	0	4.5	32.8	17.2	78	34
48	48	--	30.00	5.85	7	6	2	0	0	0.0	31.0	12.3	74	27
49	49	--	10.00	6.28	10	5	0	0	00	0.0	29.8	15.9	76	41
50	50	--	20.00	6.19	9	6	0	0	0	0.0	29.0	12.3	83	31
51	51	--	10.00	6.40	9	7	0	0	0	0.0	26.5	10.2	74	34
52	52	--	30.00	6.80	9	8	0	0	0	0.0	27.5	9.6	59	23
							Total Rainfall Jan to Dec			839.5				
							Total RFJune to Dec			834.6				

MW : Meteorological Week

ICAR-SBI, Coimbatore, Tamil Nadu

In monitoring plot, shoot borer incidence was 6.56, 3.36, 6.48 and 3.48 in the months of March, April, May and June 2018 respectively. Pyrilla and sheath mite were found in traces in April. Highest internode borer incidence (7.2%) was observed in December 2018. Woolly aphid was observed during October-November 2018 in two small patches with an average leaf rating of 0.9. The parasitoid*Encarsiaflavoscutellum* was active at 9.0% parasitism level

Table 1. Pest and natural enemy status in monitoring plot at Coimbatore, Tamil Nadu during

S. No.	Location	Insect pest	Preva-lence period	Max. incidence /population	Natural enemy	Prevalence period	Max. parasiti-zation/ population
1	Coimbatore	SB	March 2018	6.56%	-	-	-
			Arpil	3.36%	-	-	-
			May	6.48	-	-	-
			June	3.48	-	-	-
2		INB	September	4.07%	*Telenomus dingus* (60.0%)	Throughout the year	100.0%
			November	3.5 - 4.43%	-	-	-
			December	7.18%	-	-	-
			January 2019	3.3 – 3.92%	-	-	-
			February	4.46%	-	-	-
3		Woolly aphid	October 2018	Av.rating 0.90	*Encarsia (*9%)	-	-
4		Pyrilla& Sheath mite	April 2018	Traces	-	-	-
5		Sheath mite, mealy bug, top borer	September 2018	Traces	-	-	-
6		Top borer, Mealybug	October	Traces	-	-	-
7		Mealybug, Woolly aphid	November	Traces	-	-	-
8		Pink mealybug	December	Traces	-	-	-
9		Rodent	December	2.1%	-	-	-
		Mealybug	January 2019	Traces	-	-	-
10		Mealybug	February	Traces	-	-	-

UAS, Zonal Agricultural Resaerch Station V. C. Farm, Mandya

Cumulative incidence of ESB in Co 86032 sugarcane variety was 23.35 % in the first four months after planting. Incidence of TSB was 23.98% at 7th month. Incidence of Inter node borer was 29.60%. Aphid, whitefly, and pyrilla appeared in very small numbers but failed to establish and spread. Woolly aphid incidence was observed at 150 and 180 days after sowing and it was restricted to few clumps. Dipha (2larva/2pupa/clump) Encarsia (6 adults/leaf), kept the woolly aphid under control. Sugarcane pink mealy bug S.sacchari infested 8.50% millable canes with 22.65% intensity (Table-1).

Table 1: Monitoring of insect pests and bio agents in sugarcane agro ecosystem

Time of observation	**Percent Incidence**			**Woolly aphid**	**Mealy bug**		**Natural enemies**
	ES B	TSB	INB	Leaf area covered	% incidence	% intensity	
30DAP	0.5	-	-	-	-	-	
60DAP	1.25	-	-	-	-	-	
90DAP	2.50	-	-	-	-	-	
120DAP	0.0	-	-	-	-	-	
150DAP	-	4.40	-	50%	-	-	Dipha 2-3larva/leaf
180DAP	-	-	-	55%	-	-	*Encarsia* adults 7-8/leaf Micromus larva 2/leaf
210DAP	-	5.00	-		4.50	12.65	
At harvest	-	-	24.50		-	-	

CSR, MPKV, Padegaon

During this year (2018-19), the incidence of early shoot borer ranged from 0.88 to 30.29%. The peak incidence of early shoot borer was observed in 19 MW (7 to 13 May, 2018) with 30.29% incidence (Table-1). The parasitism of *T. chilonis* was observed 16 to 27 MW. The incidence of *Pyrilla* per leaf was ranged from 1 to 5. The *T. pyrillae* and *E. melanoleuca* was also observed (Table-2).

The first incidence of woolly aphid was observed in 32 MW (August 6 to 12, 2018) and it was 1 woolly aphid per leaf (Table-3). However, the peak incidence was observed in 40 MW (October 1 to 7 of 2018) with the population 21.64 aphids/leaf and it was continued up to 51 MW of 2018. The parasitoid, *Encarsia flavoscutellum* was ranged from 1 to 84 per 150 leaves and peak was observed in 45 MW of 2018 (05 to 11 November). The predator, *Micromus igorotus* was ranged from 1 to 16 per 150 leaves and peak was observed in 43 MW of 2018 (22-28 Oct). The peak predatism of *D. aphidivora* on woolly aphid was observed in 40 MW (1 - 7 October) of 2018 and it was 31 *Dipha* per 150 leaves. The *Syrphids* was observed since 42 MW of 2018 to 49 MW of 2018 and peak activity was recorded in 45 MW of 2018. The chrysopids were observed in traces. The mealybug incidence was ranged from 1.10 to 7.27 per cent and incidence was observed since 35 to 44 MW (Table-4).

Table 1 : Monitoring of insect pests and natural enemies of Sugarcane (ESB)

Period of observation (2018)	**% incidence early shoot borer**	**% Parasitism (ESB), If Any**		
		T. chilonis	***E. annulipes***	***S. inferens***
1	**2**	**3**	**4**	**5**
11 (Mar 12-18)	0.00	--	--	--
12 (Mar 19-25)	0.00	--	--	--
13 (Mar 26-Apr 01)	0.00	--	--	--

14 (April 02-08)	0.00	--	--	--
15 (April 09-15)	0.00	0	--	--
16 (April 16-22)	0.58	0.28	--	--
17 (April 23-29)	2.52	0.36	--	--
18 (April 30- May06)	15.08	1.22	--	--
19 (May 07-13)	30.29	2.33	--	--
20 (May 14-20)	20.04	1.06	--	--
21(May 21-27)	20.74	1.22	--	--
22 (May 28-June 03)	23.79	1.36	--	--
23 (June 04-10)	9.46	0.38	--	--
24 (June 11-17)	8.02	0.40	--	--
25 (June 18-24)	11.76	1.88	--	--
26 (June 25-Jul 01)	10.86	0.22	--	--
27 (Jul 02-Jul 8)	10.93	0.32	--	--
28 (July 9 -15)	5.49	--	--	--
29 (July 16-22)	2.58	--	--	--
30 (July 23-29)	1.53	--	--	--
31 (July 30-Aug 05)	0.88	--	--	--

Table 2 : Monitoring of insect pests and natural enemies of Sugarcane (*Pyrilla*)

Period of observation (2018)	**Pyrilla / leaf**	**Pyrilla/leaf**				
		T. pyrillae (% parasitism on eggs)	***Cheiloneurus pyrillae***	***Ooencyrtus papilionis***	***E. melanoleuca***	
					% Parasitism	***Egg mass & Cocoon***
1	**5**	**6**	**7**	**8**	**9**	**10**
32 (Aug 06-12)	2	-	-	-	0	0
33 (Aug 13-19)	1	-	-	-	05	0
34 (Aug 20-26)	0	-	-	-	0	0
35 (Aug 27-Sept 02)	3	10	-	-	30	0
36 (Sept 03-09)	4	10	-	-	05	2
37 (Sept 10-16)	3	20	-	-	20	1
38 (Sept 17-23)	2	30	-	-	20	2
39 (Sept 24-30)	4	40	-	-	30	3
40 (Oct 01-07)	5	20	-	-	10	2
41 (Oct 08-14)	1	10	-	-	0	0
42 (Oct 15-21)	0	0	-	-	0	0

Table 3 : Monitoring of insect pests and natural enemies of Sugarcane (Woolly aphid)

Period of observation	**woolly aphid per leaf**	**% Parasitism/Predator population per plant (per 150 leaves)**				
		Encarsia flavoscutellum	***Microm us igorotus***	***D. aphidivora***	**Syrphid fly**	***Chrysoperla zastrowi sillemi***
1	**2**	**3**	**4**	**5**	**6**	**7**
28 (July 09-15) 2018	0.00	-	-	-	-	-
29 (July 16-22)	0.00	-	-	-	-	-
30 (July 23-29)	0.00	-	-	-	-	-

31 (July 30-Aug 05)	0.00	-	-	-	-	-
32 (Aug 06-12)	2.09	1	-	-	-	-
33 (Aug 13-19)	2.85	2	-	-	-	-
34 (Aug 20-26)	4.73	3	-	-	-	-
35 (Aug 27-Sept 02)	6.52	8	-	7	-	-
36 (Sept 03-09)	8.23	12	0	4	-	-
37 (Sept 10-16)	9.00	17	0	6	-	-
38 (Sept 17-23)	15.25	24	0	10	-	-
39 (Sept 24-30)	19.90	34	0	16	-	-
40 (Oct 01-07)	21.64	46	16	31	-	-
41 (Oct 08-14)	19.62	38	12	19	-	1
42 (Oct 15-21)	21.54	74	10	22	4	-
43 (Oct 22-28)	18.75	82	16	18	7	1
44 (Oct 29- Nov 04)	16.27	70	15	16	10	Eggs of *Chrysoperla* were observed on 2-4 stools
45 (Nov 05-11)	12.98	84	9	13	13	
46 (Nov 12-18)	9.89	64	6	10	8	
47 (Nov 19-25)	5.72	42	4	6	8	
48 (Nov 26-Dec 02)	3.49	8	2	5	7	-
49 (Dec 03-09)	2.27	6	0	2	5	-
50 (Dec 10-16)	1.22	3	0	0	0	1
51 (Dec 17-23)	0.55	1	0	0	0	-
52 (Dec 24-31)	0.00	0	0	0	0	-
01 (Jan 01-07) 2019	0.00	0	0	1	0	-
Note : The incidence of woolly aphid was observed on 15-20 R area in the experimental field at one corner on Co 86032. The observations are based on the infested parts of the field.						

Table 4: Monitoring of insect pests and natural enemies of Sugarcane (Mealybugs)

Period of observation (2018)	**% incidence Mealybug**	**% Parasitism/Predator population per plant (Mealy bug)**			
		***Coccinella septempunctata* / cane**	***P. horni***	***Cheilomenes sexmaculata*/ cane**	***C. zastrowi sillemi***
1	**8**	**9**	**10**	**11**	**12**
35 (Aug 27-Sept 02)	1.10	-	-	-	-
36 (Sept 03-09)	2.24	3	-	1	-
37 (Sept 10-16)	3.66	1	-	2	-
38 (Sept 17-23)	5.10	0	-	0	-
39 (Sept 24-30)	3.06	4	-	1	-
40 (Oct 01-07)	6.76	2	-	2	-
41 (Oct 08-14)	7.27	2	-	1	-
42 (Oct 15-21)	3.08	1	-	1	-
43 (Oct 22-28)	1.75	0	-	0	-
44 (Oct 29-Nov 04)	0	0	-	0	-

In "Monitoring of insect pests and bio-agents in agro ecosystem," the incidence of early shoot borer ranged from 0.88 to 30.29 per cent. The peak incidence of early shoot borer was observed in 19 MW (7 to 13 May, 2018) and it was 30.29 per cent. The incidence of pyrilla per leaf was ranged from 1 to 5. The first incidence of woolly aphid was observed in 32 MW (August 6 to 12, 2018) and it was 1 woolly aphid per leaf. However, the peak incidence was observed in 40 MW (October 1 to 7 of 2018) and it was 21.64 woolly aphid per leaf. The parasitoid, Encarsia flavoscutellum was ranged from 1 to 84 per 150 leaves. The predator, Micromus igorotus was ranged from 1 to 16 per 150 leaves. The peak predatism of D. aphidivora on woolly aphid was observed in 40 MW (1 - 7 October) of 2018 and it was 31 Dipha per 150 leaves. The Syrphids was observed since 42 MW of 2018 to 49 MW of 2018.
The chrysopids were observed in traces. The mealybug incidence was ranged from 1.10 to 7.27 per cent and incidence was observed since 35 to 44 MW of 2018

Vasantdada Sugar Institute, Pune

The per cent incidence of early shoot borer was maximum 7.11% in April 2018, while it was free from it in February 2018. The % incidence, % intensity and infestation Index of internode bore was maximum 10%, 1.30% and 0.13 in August 2018. while it was free from it in June 2018. The % incidence and % intensity of Mealy bug was 1.0 and 0.30 in the month June 2018. This plot was free from scale insect infestation (Table-1).

The % incidence of early shoot borer was noticed maximum 7.11 % in April 2018. The % incidence of internode borer was noticed maximum 10% in August 2018.The % incidence of Mealy bug was 1.0 in the month June 2018. This plot was free from scale insect infestation.

Table 1: The percent incidence / intensity of major insect pests during 2018-19

Sr. No	Month	Early shoot borer	Mealy bug		Internode borer		
		% incidence	% incidence	% intensity	% incidence	% intensity	Infestation index
1	February 2018	0.00					
2	March 2018	0.45					
3	April 2018	7.11					
4	May 2018	0.42					
5	June 2018		1.000	0.30	0.00	0.00	0.00
6	July 2018				2.00	0.32	0.01
7	August 2018				10.00	1.30	0.13
8	September 2018				6.00	0.53	0.03
9	October 2018				3.00	0.19	0.01

East Coast Zone

Regional Agricultural Research Station, Anakapalle, ANGRAU, Andhra Pradesh

During 2018-19, less incidence of early shoot borer was observed with maximum incidence during the month of June (10.60%DH) on 93 A 145 variety due to distributed rainfall during formative stage of the crop. Along with incidence of sugarcane aphid (*Melanaphis sacchari)*, rusty plum aphid, *Hysteroneura setariae* were also observed from July month with maximum incidence during August month (33-44/leaf & 68-80/leaf). Very low incidence of *Pyrilla perpusilla* and derbid leaf hoppers (*Proutista moesta*) were observed from August-November months with maximum parasitisation of *Encarsia* (6.0%) and *Epiricania* (2.0%)during the month of November. In case of whitefly, along with *Aluerolobus barodensis* another whitefly species *Neomaskellia bergii* (Spotted whitefly) was also observed during the crop season. The spotted whitefly, *Neomaskellia bergii* initiated from September month with peak incidence during December month (5-10/leaf) whereas *Aluerolobus barodensis* observed during

December- January months. Maximum incidence of white woolly aphid, *Ceratovacuna lanigera* (>50-100% leaf area) was observed during the month of January due to low minimum temperatures (14-220C) and high relative humidity (86-92%) prevailed during November-December months and maximum incidence of scale insect, *Melanaspis glomerata* (22%) was observed during the month of February due to drought conditions prevailed during grand growth stage (Table 1& 2).

Studies on association between insects pests and weather parameters presented in Table-3 revealed that incidence of early shoot borer showed positive correlation with maximum temperature (r=0.88) and minimum temperature (r=0.99) & wind velocity (r=0.64) whereas with morning relative humidity showed negative correlation (r= -0.86). Incidence of internode borer, *Chilo sacchariphagus indicus* showed positive correlation with evening relative humidity (r=0.73), rainfall (r=0.89) and negative correlation with bright sunshine hours (r= -0.81). Incidence of sugarcane aphid, *M.sacchari* showed significant positive correlation with evening relative humidity (r=0.94), wind velocity (r=0.65), rainfall (r=0.87) and negative correlation with bright sunshine hours (r= -0.52).

Table-1: Incidence of early shoot borer, internode borer , scale insect and aphids in sugarcane eco system

Date of observation	Incidence of early shoot borer , *Chilo infuscatellus* (%DH)	Parasitisation of *Trichogramma chilonis*	Incidence of internode borer,*C. sacchariphagus indicus* (%)	Aphids population		Scale insect *M.glomerata* (%)
				Sugarcane aphid (*Melanaphis sacchari*)	Rusty plum aphid, *(Hysteroneura setariea)*	
May,18	8.20	0.0		12.0	6.5	-
June, 18	10.6	2.0	-	38.5	15.0	-
July,18	1.0	3.6	-	40.0	44.5	-
August,18	0.9	5.9	-	64.0	74.5	-
September,18	1.2	1.0	5.0	30.0	25.0	-
October, 18	0.0	0.0	18.6	8.5	7.5	-
November, 18	0.0	0.0	20.0	6.0	4.0	-
December, 18	0.0	0.0	32.0	4.5	2.0	-
January, 19	0.0	0.0	14.4	8.0	1.0	17.2
February,19	0.0	0.0	10.50	2.5	0.0	22.0

Table-2: Incidence of leafhoppers, whitefly, white woolly aphid & termite in sugarcane eco system									
Date of observatio	Leaf hoppers		Parasitisation on *Pyrilla* eggs/adults(%)		Spotted whitefly,	Whitefly,	White woolly aphid (%) incidence)	Termite (%)	Fall army worm
	Pyrilla perpusilla (Nymphs/adults/ egg masses)	Derbids *(Proutista moesta)*	*Encarsia* spp	*Fulgoraecia melanoleuca*	*Neomaskellia bergii*	*Aluerolobus barodensis*	*Ceratovacuna lanigera*	*Odentotermes* spp	*Spodoptera frugiperda*
June, 18	-	-	-	-	-	-	-	-	-
July,18	-	-	-	-	-	-	-	-	-
August,18	-		-	-	-	-	-	-	-
September,18	1-2 /leaf	1-2/leaf	0.3	0.1	3-4/ leaf	-	-	-	-
October, 18	4-8/leaf	3-5/leaf	1.0	0.3	6-8/ leaf	-	-	-	-
November, 18	8-13/leaf	3-6/leaf	2.0	0.9	6-7 adults/leaf	5-10/sq. inch	10 clumps 5% of leaf area	-	-
December, 18	3-4 N & A/leaf	0	6.0	2.2	5-10 adults/leaf	3-6/ sq.inch	35 clumps (< 25% of leaf area)	1.0	-
January, 19	2-3 N&A/leaf	0	1.5	0	1-3/leaf	-	43 clumps (> 50% of leaf area)	1.5	-
Feb,19	0	0	0	0	1-3/leaf	-	27 clumps (< 5 % of leaf area)	5.5	-
March,19	-	-	-	-	-	-	-	-	5-10% (on 30-40 days old crop)

Table-3: Association between weather parameters and insect pests in sugarcane agro ecosystem			
Weather parameters	**Incidence of insect pests on sugarcane**		
	Early shoot borer	Internode borer	Sugarcane aphid
Max temp ^{0}C	0.88*	-0.51	0.46
Min temp ^{0}C	0.99*	0.01	0.44
Morning RH(%)	- 0.86*	- 0.31	-0.40
Evening RH(%)	- 0.44	0.73*	0.94*
Wind velocity (km/hr)	0.64*	-0.13	0.65*
Rainfall (mm)	0.52*	0.89*	0.87*
BSSH	0.23	- 0.81	- 0.52

Project No. E. 34: Standardisation of simple and cost effective techniques for mass multiplication of sugarcane bio-agents

North West Zone
ICAR-IISR, Lucknow

Eumicrosoma spp. (Hymenoptera : Scelionidae) is a potential egg parasitoid of black bugs of sugarcane, *Caveleriousssweeti* Myamoto and *Dimorphopterusgibbus* and other Hemipteran insect pests of loan grass. *Eumicrosoma* spp. is mass multiplied inth laboratory on laboratory reared black bugs of sugarcane. Black bugs are mass multiplied on natural host plant in the laboratory and *Eumicrosoma* spp. mass multiplied on eggs of black bug through the method developed by Maha Ram Singh at ICAR: IISR, Lucknow in 2007.

Rearing of black bug, *Dimorphopterusgibbus* (Fabricius) and *CaveleriusSweeti*Myamoto

Rearing of black bug completes in to two steps.

Muslin bag for oviposition: A muslin bag measuring 20.0 x 8.0 cm was developed. Three to four cut topes of sugarcane with 5 cm leaf portion are kept in a muslin bag and field collected male & female (1:1) are released into the bag. In one bag 50 pairs of insect can be accommodated. After release of insects open end of bag is closed with rubber bands and kept in tray for egg laying. Eggs are glued to the bottom of tray which are collected daily and stored in homoeopathic vials at ambient room temperature for further development. Fresh eggs are rice shaped and creamy white in colour. At maturity eggs become dark orange in colour.

Paper cone for nymph development: Paper cone was developed from a sterilized paper of 25 cm^2 size and cut cane (8-10) with leaf sheath. One such cut piece of sugarcane stalk was placed at the lower left corner of the paper and rolled in a manner that it takes the shape of cone without touching the upper end of cut stalk. Narrow end of the paper cone was tightened with the help of rubber bands.

Mature egg (orange in colour) or freshly hatched nymphs are released to the paper cone and its upper broader end is closed by folding twice and inserting the rear corner of the second fold into the first one. Dried out setts and leaf tops are being changed at the interval of 4-5 days in summer and 5-6 days interval in winter and rainy seasons. During change of insect from old cone to new ones due precaution of mechanical damage should be taken over.

Incubation, nymphal and total period of lifecycle varied from 6.0 to 10, 23 to 47, 31 to 57 days, respectively (Table-1).

Table -1: Duration of different life stages of *Dimorphopterus gibuus* on natural food.

Duration	Incubation period (days)	Nymphal period (Days)	Total period (days
February-March	6-8	26-27	32-35
April-May	8-9	25-28	33-38
June -July	6-8	25-27	31-35
August- September	6-7	23-26	29-33
October -November	8-9	27-29	35-38
December-January	9-10	45-47	54-57

Mass multiplication of *Eumicrosoma*sp (Hymenoptera: Sceilionidae) an egg parasitoid of Lygaeid bugs of sugarcane

Eumicrosoma sp. is a potential egg parasitoid of black bug of sugarcane Biology and rearing of *Eumicrosoma* sp. was developed at IISR, Lucknow. Nucleus culture of the parasitoid was maintained in the laboratory. *Eumicrosoma* sp. is a black shiny Sceilionid wasp. Eggs of black bug *D. gibbus* were used as laboratory host.

Fresh eggs (fresh or 24 hour old) are offered to the gravid female in homoeopathic vials for parasitization. Parasitized eggs became blackish in colour from one end and in few days turned completely black to shiny black just before hatching. No superparasitism was observed Parasitization ranged from 38.00 to 89.00 percent. Single gravid female could parasitize on an average of 15.67 eggs with a range of 5-22

eggs. Development period of prasitoid varies from 7-11 days. Parsitisation and longevity of adults varies from 62.5 to 82.50 per cent and 1-3 days, respectively (Table-2).

Table-2: Parasitisation by *Eumicrosoma* spp. and its development

Duration	Parasitisation (%)	Development period (Days)	Adult emergence (%)	Longevity of Adults (Days)
February	38-41	9-10	65.00	1-2
March	43-53	8-9	75.00	2-3
April	49-55	8-9	62.8	1-2
May	39-45	8-9	65.5	1-2
June	45-53	8-9	62.5	1-2
July	55-67	8-9	79.00	2-2.5
August	55-60	7-8	80.5	2-3
September	74-89	7-8	82.50	2-3.5
October	71-75	7-9	75.50	2-2.5
November	59-53	8-9	62.89	2.2.5
December	38-45	9-11	79.00	1-2
January	Low	9-11	80.75	1-1.5

Peninsular zone

ICAR-SBI, Coimbatore, Tamil Nadu

For economizing mass culture of entomopathogenic fungi (EPF), media based on agricultural by products and several grains were assessed with and without addition of peptone at different concentrations (5, 10 and 15%). For production of *M. anisopliae*, no differences among the concentrations used was observed among the byproducts *viz*., extracts of rice bran, wheat bran, red gram husk, sesame seed cake, groundnut cake, cotton seed cake along with peptone supplement which were compared with Jaggery and SD medium. The spore production ranged between 2.13 x 10^9/100ml (cotton seed cake) to 8 x 10 ^{9}/100ml (wheat bran). When the media were assessed without peptone supplement, irrespective of the concentration, the effect of media showed overlapping levels of significant variation. Cotton seed cake was the best (7.3 x 10^9/100ml) which was on par with Jaggery, wheat bran, groundnut cake (4.8 x 10^9/100ml) and SD broth (5.2 x 10^9/100ml). For *B. brongniartii* , irrespective of concentrations tested many media *viz*., coconut seed cake (11.93 x 10^7 /ml), rice bran extract (11.02 x 10^7 /ml), wheat bran (11.67 x 10^7 /ml),red gram husk (8.27 x 10^7 /ml) and cotton seed cake (5.8 x 10^7 /ml) were on par and significantly better than the others. Wheat bran at 15% and rice bran extract at 15% were most cost effective.

CSR, MPKV, Padegaon

Chrysoperla carnae was multiplied on sugarcane woolly aphid in field. The experiment was planted on 13.03.2018 with regular variety Co 86032. The green shadenet of 5 m x 5m x 5m were erected for mass multiplication of *Chrysoperla carnae (Chrysoperla zastrowi sillemi)***.** The inundative (repeated) releases of woolly aphids were done since 34 to 48 MW for more development of woolly aphid culture in shade net. The 26 to 42 per cent leaves were covered with woolly aphid since 39 MW. The 1-3 eggs masses and 4-5 larvae of *Chrysoperla zastrowi sillemi* were released in 41-45 MW in shade net. The honey and water solution in Petri-plates were also kept in shade net. The caster flowers were also kept for alternate days to enhance the fecundity of *Chrysoperla*. The average 2-5 neonate grubs were observed per stool since 45 MW of 2018 to 51 MW of 2018.

Vasantdada Sugar Institute, Pune

Filling of *Corcyra* rearing boxes: Emergence of adults took place 40-45 days and it continues for further 45 days. The wooden *Corcyra* rearing cages of 20x10x7 cubic inch are used for filling of heat sterilized 2.5 Kg of half crushed jowar flour. Dried yeast tablets are mixed in it to increase the nutritive value of the diet. Nucleus culture of 0.5 cc (Approximately 10,000) *Corcyra* eggs has introduced in it. The rearing cage has a wooden lid at the top. The lid has a window of wire mesh for ventilation. Laboratory sanitation

and sterilization of wares has adopted to avoid fungal / bacterial contamination. At hatching, *Corcyra* larvae feed on the provided diet throughout their larval period and pupate in the cages. In each cage, 10,000 introduced *Corcyra* eggs hatched into only 3000 to 5000 larvae/adult within 60 days. The life of *Corcyra* adult varies from 3 to 5 days.

Collection of host eggs: The emerged *Corcyra* adults were collected regularly, using plastic tubes preferably in morning hours. Collected adults have placed to egg laying chamber for mating. A size of wooden *Corcyra* eggs laying chamber is 8x8x8 cubic inch. Eggs laying chamber has a wire mesh at bottom and a wooden lid at the top with wire mesh window to provide the honey (35% diluted) swab to adult moths as a feeding material. The eggs laid by the female come out directly through the wire mesh fitted at the bottom of egg laying chamber. The chambers are provided with iron steel tripod stand with egg collecting vial at the bottom. On the next day, an egg-collecting vial has removed from eggs laying chambers. Dust, scale and antennae are separated with the help of tea sieve, hairbrush and blotting paper. Cleaned eggs were counted with measuring cylinder/cc unit and poured in screw jar & stored at 10 C in B.O.D. incubator up to 10 to 21 days and used for *Trichogramma* multiplication. About 1265.2 cc (251.24 lac) eggs of Corcyra eggs with a monthly average of 104.68 cc (20.94 lac) (Table-1) and 976 Tricho cards (195.20 lac parasites) (*Trichogramma chilonis)* were produced. Tricho cards were distributed for about 44.33 ha area and 125 cc Corcyra Eggs to Stae Govt as nucleusculture (Table-2).

Table-1: Monthly production of *C. cephalonica* eggs and *T. chilonis* parasitoids cards during

Sr. No.	Month	*Corcyra* eggs Produced (cc)		*T. chilonis* parasitoids cards	
		Per month	**Per day**	**Per month**	**Per day**
1	April 2018	50.9	1.69	83	2.77
2	May 2018	11.50	0.38	6	0.19
3	June 2018	16.30	0.54	15	0.50
4	July 2018	52	1.67	13	0.42
5	August 2018	229.30	7.72	139	4.48
6	September 2018	99.9	3.33	140	4.67
7	October 2018	53.6	1.72	47	1.51
8	November 2018	65.4	2.18	21	0.7
9	December 2018	91.1	2.93	48	1.54
10	January 2019	221.7	7.15	146	4.70
11	February 2019	172.3	6.17	159	5.68
12	March 2019	192.2	6.2	159	5.12
	Total	1256.2	41.68	976	32.28
	Average	104.68	3.47	81.33	2.69

Table-2:Supply of *T. chilonis* parasitoids cards/Corcyra eggs during 2018-2019

Name of sugar mill/other	No. of Tricho cards supplied	Amount (A) (Rs.)	Area covered (ha)	Corcyra eggs supplied (cc)	Amount (B) (Rs.)
Rajarambapu, PatilSangali.	12	1140	0.8		
Y. M. Krishana, Satara	5	475	0.33		
VNMKV, Parbhani	3	285	0.2	10	950
Bio-control Lab., Aurangabad	4	380	0.27	15	1425
Bio-control Lab., Dhule	0		0	75	7125
Bio-control Lab., Pravaranagar	5	475	0.33		
Bio-control Lab., Buldhana	0			5	475
Bio-control Lab., Jalgaon	0			20	1900
Farmers	220	19760	14.67		
Total A=	249	22515	16.6		

Total B=				125	11875
Total C= (A+B)		34390			
VSI Farm (Gratis) Total D=	422	**40090**	28.13		
Grand Total F= (C+D)=		**74480**			

East Coast Zone

Regional Agricultural Research Station, Anakapalle, ANGRAU, Andhra Pradesh

During 2018-19, *Pyrilla* adult were collected from the field and reared under laboratory at temperature, ranging from 25^0 to 26^0C. The glass jar, having 15 cm diameter and 20 cm height, was used for rearing. The bottom of the jar was filled with 4 to 5 cm thick layer of sterilized moist sand. About 10 cm long leaf cut, 6 to 7 per jar were vertically thrust in the sand layer of glass jar. In each jar, 4-5 pairs of male and female *Pyrilla*, collected from the field, were released for egg laying purpose. The top of the jar is covered with muslin cloth by using rubber band. On hatching of the eggs, the nymphs were transferred daily with the help of a fine hair brush to same type of glass jar, prepared for rearing adults. After allowing 4-5 days feeding without disturbance in the same jar, the nymphs were transferred to another jar, wherein they were further rear for 4-5 days and transfer to next jar. The same process continued till adult emergence. After production of *Pyrilla* nymphs and adults, field collected egg mass or cocoons of *F. melanoleuca we*re released in the glass jars. Fresh leaves of sugarcane were added at 3 to 4 days interval simultaneously, dried leaves were removed from the Jar. By this technique, harvested eggs and cocoons of of *F. melanoleuca* daily and utilised for field release programme. A total of 171 cocoons and 23 egg masses of *F. melanoleuca* were multiplied and utilized for release in IPM module plot (Table 1).

Table-1: Mass multiplication of *Fulgoraecia melanoleuca*

Month	**No. of Nymphs of host ins *Pyrilla* reared**	**Cocoons of *E.melanole* produced (No)**	**Egg masses**
Sepember,18	0	0	0
October, 18	0	0	0
November,18	0	0	0
December, 18	187	123	16
January,19	91	48	7
Total	**278**	**171**	**23**

Project No. E-38: Formulation and validation of IPM module sugarcane insect-pests.

North West Zone
UPCSR, Shahajahanpur

The experiment was conducted on half acre plot size with UP 05125 as a treated and half acre plot as untreated. Both the plots were separated by keeping 100 meter distance . All the IPM module of sugarcane insect pests was adopted in treated plot. The IPM treatments included deep ploughing for exposure of white grub predation, cane setts planting of healthy cane setts treated for 2 minutes in the solution of chlorpyriphos 25% EC @ 40 ml in 10 liter of water, soil application of chlorantraniliprole 0.4G @ 22.5 kg/ha at the time of planting, collection and destruction of egg masses and damaged shoots, setting up of sex pheromone traps two week of planting @ 27/ha (lure changed at an interval of 45 days), spraying of chlorantraniliprole 18.5 SC @ 375 ml/ha at 60 DAP, detrashing of lower leaves, removal of egg masses of pyrilla and infested canes at 90 days, detrashing of lower leaves after 150 days & spraying of clothianidin 50 WDG @ 250 gm/ha after detrash lower leaves. The untreated block was raised under farmer's practice. The IPM block recorded 53.13 percent germination against 45.15 percent in untreated block. The treated block recorded minimum cumulative incidence of shoot borer (1.48%), 3rd brood of top borer (0.21%), 4th brood of top borer (2.40%) and at harvest (6.67%) against 3.87, 2.28, 5.08 and 8.67 percent in the untreated block, respectively. Regarding the stalk borer infestation the infestation index was 2.52 in IPM block against 3.67 in untreated block. The IPM block recorded higher number of tillers (107000/ha), millable canes (78000/ha) and cane yield (57.20 MT/ha) against 85000, 69000/ha and 48.5 MT/ha, respectively in the untreated block. The % increase in germination, tillers millable canes and cane yield was recored 17.67%, 25.88%, 13.04% and 17.93% higher in IPM over untreated block, respectively. Regarding the growth attributes the IPM block received total cane height (2.36 m) millable cane height (1.59 m), number of internodes(21) and cane girth (1.39 mm) against 2.29, 1.30 and 20 and 1.37 in untreated block respectively.(Table- 1).

Project No. E-38

Table 1(A): Formulation and validation of IPM module sugarcane insect-pests.

S. N.	Treatments	%Ger.	Tillers/ha (000)	NMC/ha (000)	Yield MT/ha
1	I P M Block	53.13	107	78	57.2
2	Farmer Practice	45.15	85	69	48.5

Table 1(B):Formulation and validation of IPM module sugarcane insect-pests.

S. N.	Treatments	. Growth parameter			
		Total cane height (m)	Millable cane height(m)	Number of inter nodes	Cane girth (mm)
1	I P M BLOCK	2.36	1.59	21	1.39
2	Farmer Practice	2.29	1.30	20	1.37

Table1(C) :Formulation and validation of IPM module sugarcane insect-pests.

Insect-pest	% Incidence of Insect-Pest	
	I P M Block	Farmer Practice
Shoot bore r (Cumulative)	1.48	3.87
Top borer (3nd brood)	0.21	2.28
Top borer (4th brood)	2.40	5.08
Top borer (At harvest)	6.67	8.67
Stalk borer (Infestation index)	2.52	3.67

Peninsular Zone

UAS, Zonal Agricultural Resaerch Station V. C. Farm, Mandya

Doring 2018-19 four different types of waterless pheramone traps were compared with vota watertrap for their efficacy in trapping sugarcane borer pests. This experiment was conducted with eight treatments with four replications against ESB for six weeks. All the waterless traps and vota water trap failed to trap more than one moth per week. This may be because of lower incidence of the pest or it may be because of the problem associated with the trap.

Table 1: Formulation and validation of IPM module of sugarcane insect pests

Pest	IPM Plot	Farmers practice plot
	Infestation level (%)	Infestation level (%)
Early shoot borer	3.50	5.25
Top shoot borer	7.50	9.75
Internode borer	14.50	18.00
Woolly aphid	8 clumps 40%leaf area covered	12clumps 50% leaf area covered
Pyrilla	<0.5adults/nymphs/clump	<0.5adults/nymphs/clump
Yield	61.50t / ac	55.75t/ac

CSR, MPKV, Padegaon

Data recorded on growth parameters, per cent incidence of early shoot borer (ESB), internode borer, mealy bug, total number of millable canes (000 per ha) and yield (t/ha) are presented in table 23. The incidence of top shoot borer, mealy bug, scale insect, pyrilla, white fly etc. are negligible and hence releases of *Epiricania (=Fulgoreica) melanoleuca* , Spray clothionidin 50 WDG @ 250 g/ha, as well as installation of 'Biological-cum-Mechanical' traps were not done. In Farmers practice block, all measures were undertaken as per technical programme.

In IPM block, the growth parameters *viz.*, per cent germination at 45 DAP, total cane height (cm), millable cane height (cm), number of internodes and girth of cane showed higher than farmers practice block (Table-1). In IPM block, less cumulative incidence of early shoot borer recorded (6.40 %) as compare to farmers practice block (27.10%). Internode borer incidence and intensity was less in IPM block 16 and 1.43 per cent as compare to farmer's practice 32 and 4.06 per cent during harvesting stage. The incidence of mealy bug was low. IPM block recorded 80.82 thousand millable canes per ha as compare to farmers practice 70.90 thousand /ha. In IPM block higher cane yield (105.86 t /ha) was recorded as compare to farmers practice (78.35 t /ha).

In the experiment, "Formulation and validation of IPM Module of sugarcane insect pests," Lowest cumulative incidence of early shoot borer recorded in IPM block (6.40 %) as compare to farmers practice block (27.10%). Internode borer incidence and intensity was less in IPM block 16 and 1.43 per cent as compare to farmers practice 32 and 4.06 per cent during harvesting stage. IPM block recorded 80.82 thousand millable canes per ha as compare to farmers practice 70.90 thousand /ha. In IPM block higher cane yield (105.86 t /ha) was recorded as compare to farmers practice (78.35 t /ha).

T1: IPM Block [Peninsular Zone]

Stage of the cultivation/Period	Target pest	Activities need to be carried out*
Seed selection	Borer, Mealy bug, scale insect, woolly aphid	➢ Selection from uninfested field. ➢ Rejecting infested pieces.
Pre-planting	Borer, Mealy bug, Scale insect, white grub, termite	➢ Dipping the setts for 2 minutes in the solution of chlorpyriphos 20 EC @ 40 ml in 10 litre of water. ➢ Ploughing for exposure of stages of white grub for predation.

At planting	Borer, Scale insect, white grub, Termite	➢ Soil application of chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting.
At 45 day	Borer	➢ Collection and destruction of egg masses and damaged shoots. ➢ Setting up of sex pheromone traps two weeks after planting @ 27/ha (Lure change at an interval of 45 days).
At 60 day	Borer, Pyrilla, scale insect, mealy bug	➢ Spraying of chlorantraniliprole 18.5 SC @ 375 ml/ha at 60 DAP
At 90 day	Borer, Pyrilla, scale insect, mealy bug	➢ Detrash the lower leaves, remove egg masses and infested canes.
At 150 day	INB, Mealy bug, Scale insect, whitefly, pyrilla	➢ Release of *Epiricania (=Fulgoreica) melanoleuca* @ 2000 cocoons and 250 egg mass/ha for the management of pyrilla. ➢ Detrash the lower leaves after 150 days of planting
At 180 day	INB	➢ Removal of water shoots of the crop.
At 210 day	INB	➢ Removal of water shoots of the crop.
At 240 day	INB	➢ Removal of water shoots of the crop.
June-July	Pyrilla, whitefly, scale insect, mealy bug	➢ Installation of 'Biological-cum-Mechanical' traps @ 20/ha during first fortnight of June for management of whitefly. ➢ Spray clothionidin 50 WDG @ 250 g/ha after detrash lower leaves.
*** Need based application of insecticides, if insect pest cross the ETL.**		

T2: Farmer practices of the Zone [Peninsular Zone]

➢ Soil application of carbofuran @ 1 kg ai/ha at pre-planting

➢ Soil application of carbofuran @ 1 kg ai/ha at 30 and 150 DAP.

➢ Need base application of any one of the following insecticide through ground spraying at the appearance of pest.

(i) DDVP 76 EC @ 300 g ai/ha OR
(ii) Acephate 75 SP @ 500 g ai/ha OR
(iii) Quinalphos 25 EC @ 300 g ai/ha OR
(iv) Triazophos 40 EC @ 500 g ai/ha

Table 1 : Validation of IPM module vs farmers practice

Parameters	**T_1 - IPM Block**	**T_2 - Farmer's Practice**
Growth Parameter's		
Per cent Germination 45 DAP	88.07	65.63
Total cane height (cm)	312.5	302.5
Millable cane height (cm)	270.5	260
Number of Internodes	19.3	17.90
Girth of Cane (inch)	5.20	4.60
Early shoot borer		
45 DAP (%)	0.00	0.50
60 DAP (%)	1.20	12.36
90 DAP (%)	2.80	13.42
120 DAP (%)	2.40	8.26
Cumulative Incidence (%)	6.40	27.10
Number of bored plants /ha	5882.33	26040.68
Internode Borer (%)		
At 150 DAP	0	8

At Harvest (Intensity)	16 (1.43)	32(4.06)
Mealy Bug (%)		
At 150 DAP	0	0
At Harvest	2.43	7.68
Yield		
Number of Millable cane ['000 / ha]	80.82	70.90
Cane yield [t / ha]	105.86	78.35

Vasantdada Sugar Institute, Pune

The germination % at 45 DAP was 77.20 % and 72.90% in IPM block and farmers practice block respectively. The tillering ratio at 120 DAP was 3.56 & 2.99 in IPM Block and Farmers practice block, respectively.

At 60 DAP the mean % incidence of early shoot borer was statistically low 0.60 in IPM Block while in farmers practice it was 1.43. At 90 DAP the mean % incidence of early shoot borer was statistically low 1.06 in IPM Block while in farmers practice it was 4.36. At 120 DAP the mean % incidence of early shoot borer was statistically low 0.54. in IPM Block, while in farmers practice it was 6.32.

The cumulative % incidence of early shoot borer was 1.84% in IPM block, while 11.23% in farmers practice block. No. of bored plants/ha were 1786 and 11643 in IPM Block and Farmers practice block respectively.

At 150 DAP in IPM block % incidence, % intensity and infestation index was 4.00, 1.59 and 0.08 % respectively, while in farmers practice block% incidence, % intensity and infestation index was 6.00, 2.27 and 0.15 % respectively. % incidence and intensity of mealy bug was 1.00 and 0.37 %, respectively in farmers practice block, while IPM block was free from it.

At 11 months after planting in IPM block % incidence, % intensity and infestation index was 4.00, 0.25 and 0.02 % respectively, while in farmers practice block% incidence, % intensity and infestation index was 6.00, 0.35and 0.03 % respectively. % incidence and intensity of mealy bug was 1.00 and 0.05 %, respectively in farmers practice block, while IPM block was free from it.

At harvest total cane height, was numerically high 323 in IPM block while 308.67 in farmers practice block. Malleable cane height, Single cane weight and no. of internodes werestatistically high294.37, 2.73 and 23respectively in IPM block, while it was 266.03,2.24 and 21 in farmers practice Block, respectively. CCS % and CCS t /ha was numerically high 14.15 and 25.36 in IPM Block, while 13.71 and 15.80 in farmers practice block.

At harvest plant population per ha was statistically high 65643 in IPM Block and it was 51714 in farmers practice block. At harvest sugarcane yield per ha was high 179.20 in IPM block and it was 115.84 in farmers practice Block.

At harvest B:C ratio was high 4.66 in IPM block and it was 3.36 in farmers practice Block (Table 10).

The cumulative % incidence of early shoot borer was 1.84% in IPM block, while 11.23% in farmers practice block. At harvest plant population per ha was statistically high 65643 in IPM Block and it was 51714 in farmers practice block. At harvest sugarcane yield per ha was high 179.20 in IPM block and it was 115.84 infarmers practice Block.

T1: IPM Block [Peninsular Zone]

Stage of the cultivation/Period	Target pest	Activities need to be carried out*
Seed selection	Borers, Mealy bug, scale insect, woolly aphid	• Selection from uninfested field. • Rejecting infested pieces.
Pre-planting	Borers, Mealy bug, Scale insect, white grub, termite	• Ploughing for exposure of stages of white grub for predation. • Dipping the setts for 2 minutes in the solution of Chlorpyriphos 20 EC @ 40 ml and Carbendazim 50% @ 50gm in 10 litre of water.
At planting	Borers	• Soil application of Fertera 0.4G @ 22.5 kg/ha at the time of planting.
At 45 day	ESB	• Release of Tricho cards @7.5 cards/ha
At 60 day	Borer	• Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 60 DAP
At 75DAP	ESB	• Release of Tricho cards @7.5 cards/ha
At 150 DAP	INB	• Release of Tricho cards @7.5 cards/ha
At 180 DAP	INB	• Release of Tricho cards @7.5 cards/ha

T2: Farmer practices of the Zone [Peninsular Zone]

- Soil application of carbofuran @33 kg /ha at pre-planting

b) Design: Paired plot

c) Type of soil: Heavy (T2)/ light (T1)

d) Plot size: Half acre plot for treated and untreated separated by keeping 100m distance

e) Location: Vasantdada Farm, VSI, Pune

f) Variety: VSI08005

g) Date of planting: 30.01.2018

h) Date of harvesting: 2.03.2019

j) Methodology :

East Coast Zone

Regional Agricltural Research Staion, Anakapalle, ANGRAU, Andhra Pradesh

During 2018-19, in IPM module less incidence of early shoot borer, internode borer and more number of shoot population at 120 DAP (4.62 %DH; 48.43% & 5.71%; 69,330/ha) were recorded compared to zonal recommendation (15.48%DH; 64.98% & 8.71; 64,875/ha) whereas in untreated control, high incidence of early shoot borer, internode borer (31.81 %DH, 80 %, 12 %) and less number of shoots at 120 DAP (52,515 /ha) were recorded. Growth parameters *viz.*, total cane length (2.26m), millable cane length (2 m), number of nodes (21) and cane girth (2.46cm) were relatively more in IPM module compared to zonal recommendation (1.90 m, 1.75m, 19 & 2.4cm). Superior cane yield was recorded in IPM module (70.20t/ha) compared to zonal recommendation (68.80t/ha) whereas in untreated control it was 57.80t/ha.

(Table 1, 2 & 3).

Table-1: Impact of IPM technology on the incidence of early shoot borer and on shoot population

Treatment	Germination (%)	Per cent incidence of early shoot borer (%DH)					Shoot population 120 DAP/ha
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative up 120 DAP (%DI	
T1- IPM Module	66.95	1.49	1.37	0.72	1.04	4.6	69,330
T2- Zonal recommendation	62.00	10.0	1.89	1.92	1.67	15.5	64,875
T3- Untreated control	45.00	20.40	6.00	2.41	3.00	31.8	58,515

Table-2: Impact of IPM technology on internode borer, scale insect and yellow leaf incidence

	Internode borer (%)		Infestation index	Scale insect	YLD incidence
	Incidence	Intensity		Incidence (%)	(%)
T1- IPM Module	48.4	5.71	2.75	0.0	0.0
T2-Zonal recommendation	65.0	8.71	5.66	0.0	2.0
Untreated control	80.0	12.0	9.60	33.0	26.0

DAP : Days after planting

Table -3:Impact of IPM on growth parameters, juice sucrose, NMC and cane yield

Treatment	Total cane height (m)	Millable cane height (m)	Number internodes	Girth of cane (cm)	Juice sucrose (%)	NMC/ ha (000')	Cane Yield (t/ha)
T1- IPM Module	2.26	2.00	21	2.46	20.04	64.35	70.2
T2-Zonal recommendation	1.90	1.75	19	2.40	20.02	59.55	68.8
Untreated control	1.83	1.68	18	2.20	18.95	53.52	57.8